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Railway Age Gazette

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March 16, 1917.

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Railway Age Gazette

Volume 62 March 16, 1917 No. 11

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Until recently all responsibility for the protection of pedestrians and occupants of vehicles at grade crossings has been placed on the railroads. In compliance with governmental pressure the carriers have erected gates, hired flagmen, installed warning bells and separated grades. The only one of these measures which is a sure preventive of accidents is grade separation, the excessive cost of which makes its general adoption impracticable. As to the various methods of giving warning, they are all faulty in that they train the public to depend upon signals rather than to look for approaching trains. All methods of warning will fail at times and when they do, the pedestrian or the driver depending on them is in danger. Only recently two persons were killed at a grade crossing in Illinois because they started across the tracks when the gates were cleared by mistake. A vigorous campaign of publicity by the Illinois Central has succeeded in shifting some of the responsibility for accident prevention on the drivers of motor vehicles. On March 1, a bill requiring motorists to stop, look and listen before crossing railroads at grade, was passed by the lower house of the Tennessee legislature and referred to the Senate. On February 21, a "stop, look and listen" ordinance with a maximum penalty of $200 and a minimum of $5 was passed at Centralia, Ill. Like ordinances have been put into effect at Makanda, Ill., and in six Mississippi municipalities. The Illinois Central reports that motorists are strictly observing this legislation and, furthermore, that not a single accident has occurred at these points since the passing of the ordinances, some of which have been effective for four months. Judging from the experience of this railroad, it would seem that other lines might well follow its example, thereby reducing avoidable accidents and expensive claim suits.

Responsibilty of Public at Grade Crossings

The January net earnings of eastern trunk lines did not show up well as compared with January, 1916. The operating income of the Pennsylvania Lines East in January, 1917, was $4,449,000, a decrease of $172,000. The showing of the Lines West was not by any means as good, operating income amounting to $1,233,000 this year, a decrease of $1,104,000, and whereas on the Lines East more than half of the increase in expenses was for maintenance of way, on the Lines West by far the greater part of the increase in expenses was in cost of transportation. The New York Central's net has turned the corner and is now on the decrease. Operating income in January, 1917, amounted to $3,348,000, or $951,000 less than the operating income in January, 1916. In New England the New Haven is not earning much more than fixed charges, but since in January, 1916, the road was struggling with the worst kind of congestion, the comparison between January this year and last is favorable to this year. In the south the continued gains in operating revenues are not being entirely consumed by the rise in expenses. Southern Railway's gross increased 19 per cent, while expenses and taxes increased only 15 per cent. Louisville & Nashville's gross increased 18 per cent and expenses not quite 17 per cent. The transcontinentals that have reported for January are making a fine showing as compared with the previous year. Southern Pacific's total operating revenues amounted to $14,236,000, an increase as compared with the previous year of $4,398,000 and of this increase the company was able to save $2,495,000 for net. The Norfolk & Western is in a class by itself. Month after month in 1916 the company showed remarkable gains in net as compared with the previous year and in January, 1917, gross increased, as compared with January, 1916, nine per cent and expenses eight per cent, leaving a gain of ten per cent in operating income. For the eastern trunk lines February will probably make a less favorable showing even than January.

The Trend of Earnings in January

A large railway, after thoroughly trying out a shop scheduling system at its main locomotive repair shop, has recently extended the practice to several of the smaller shops. Briefly, the progress of all of the various classes of work is so scheduled that the parts will be finished and ready for application in advance of the time when they will actually be required for reassembling. To successfully carry out such a system requires a well-balanced shop, and not the least of the advantages is that weak spots in shop facilities and organization are automatically located and must be corrected if the scheduling system is to be a success. Another natural result of the successful introduction of such a system is to eliminate lost motion and inefficiency and reduce to a minimum the time

Common Sense and Locomotive Repairs

that the locomotives are held in the shop. The shop superintendent or general foreman is relieved of a great deal of detail which can just as well be handled by subordinates and is thus enabled to give all of his time to the more important problems and to improving the weak places and the organization as a whole. It is thus possible to bring up the standard of workmanship and to return the locomotives to service in the best possible condition. While the introduction of the scheduling system is based upon a careful analysis of the work which is required on the different classes of locomotive repairs, it should not prove difficult to install, and it is based purely on commonsense methods. It is hard to understand why the railroads in general have not insisted upon the installation of such schedules long before this. The *Railway Age Gazette* and the Railway Mechanical Engineer have consistently advocated the shop scheduling system for many years. The mechanical department associations have been slow in appreciating the advantages of this system, and, except for one of the annual meetings of the International Railway General Foremen's Association, have given little attention to the consideration of such schedules. It is high time that drastic steps were taken by the managements to insure the prompt installation of first-class approved shop scheduling systems in all of the more important shops, at least.

THE ENGINEER IN RAILWAY SERVICE

WHAT is the matter with the engineer in railway service? In other words, why are not more of the engineering graduates of our universities entering the service of the railways, and why are not more of those who do enter remaining in their employ and being promoted into operating and executive positions? These questions which were asked in these columns several weeks ago have brought out a number of very interesting and illuminating replies which are published on another page in this issue. The answer apparently is disclosed by the reading of these discussions. The trouble seems to lie with the system under which the engineer is employed on most railways. Technically-trained men are filling important positions in all branches of public, commercial and industrial activities. They are found in the executive positions of many large corporations, including not a few railways. Therefore, the fact that they have not been recruited for operating and executive positions on many roads does not support the claim that railroading is of so peculiar a nature that college graduates have unfitted themselves by training for all but minor positions in this service. Nor is it possible to accept the views of one contributor who suggests that engineers have so much professional pride that they look with distaste upon any position that takes them away from purely technical activities. The college recruit in the manufacturing company does not remain a machine designer. He becomes in most cases a production superintendent, a purchasing agent or a salesman, all positions involving duties as remote from pure science as those of a railway division superintendent.

In years gone by, the railroads generally secured the most promising men from both graduates and non-graduates. The lack of other opportunities and the fascination of railroad work served to hold them in spite of the relatively small pay and the unsatisfactory working conditions. That day is past. Today the college professors maintain that, with some exceptions, the railways as a class are now securing "the poorest third" of the graduates. If this is true, and it must be maintained that those most closely in touch with recent graduates are in a position to observe this tendency, it should be a cause of serious concern to the railways.

It is important to analyze the causes for this marked decrease in the attractiveness of railway employment for engineers. One of the reasons for this change undoubtedly arises from the vast expansion in the industrial field during the last few years. With the rapid development of large corporations, methods have been devised to enlist in their service the most likely men, and among them the technically trained men are receiving the preference. If the railway companies are to secure their share of the most capable men they must meet this competition and this they are in general failing to do.

Compensation is an important consideration. This involves inducements considerably in excess of those required to secure a fairly good chainman or rodman. The railways have not yet come to the view point of a number of large corporations that a capable young man is an investment and that they can afford to pay him more than he may be worth immediately while training him for more valuable work in the future. However, compensation is only one consideration. Systems of training and definite lines of advancement are essential. The better class of college graduates will accept positions with relatively low salaries to start, if they can satisfy themselves that there are opportunities ahead.

Many of the corporations are not content with the selections secured by the inducements that presumably give them the pick of the graduating classes, but these men are reclassified by a careful and painstaking process of several years' duration, commonly known as the apprenticeship system. Frankly recognizing the inexperience and unfitness of the fresh graduates for any positions of even minor importance they actually put these men through a course of training to give them the necessary practical experience and also to enable their employers to discover which of them contain the stuff from which officers can be made. On the average railroad, on the other hand, the young engineer is employed because he knows more about transits, profiles, curves and grades than the man who has not attended college. He is selected to meet an immediate and definite need, exactly as a painter, a stone mason or a plumber is hired. The possible or probable qualifications of the applicant for advancement to an executive positon receive only slight consideration. Also, in general, advancement is not by careful selection, but by a haphazard system. The man of greatest ability, most forceful personality and strongest perseverance usually wins out in the end, if he sticks, it is true; but under these conditions the company is always in danger of losing or does lose much promising material while it can not secure the best results from many men of unquestionable merit, who are not strong enough to overcome the deficiencies of the system. Those roads which have been most successful in their development of technically trained men and which are attracting them into their service today in the largest numbers are offering them definite lines of advancement. When a young engineer sees that these who have preceded him have received recognition and advancement, he is willing to remain in the service with the hope of ultimately receiving the same promotion.

The railways need college-trained men today and they will need them in even greater numbers in the future, because of the increasing complexity of the problems they will be called upon to solve. Technical training alone is not an assurance of ability, but it should assist a man in meeting these problems as they arise. The technical school trains a man to think clearly; to analyze and to separate the irrelevant from the fundamental. Other things being equal, this training will produce results when men who have it are placed in competition with those who have not had that advantage; but technical training cannot be expected to neutralize the shortcomings of any group of men from which the best two-thirds already have been picked.

The railways cannot afford to allow present tendencies with respect to technically educated men to continue. They need men of ability and education in all departments and they should be able to compete with any other industry for them.

VIOLATIONS OF COMMERCE LAW BY SHIPPERS

WHILE prosecutions, indictments and convictions of railways for violations of the interstate commerce law usually receive wide publicity, similar cases against the patrons of the railways, shippers, passengers and others, for some reason attract less attention, although they are more numerous than the cases against carriers. Somewhat over a year ago the *Railway Age Gazette* called attention to the fact that in every year but two since the commission's division of prosecutions was organized in 1907 there have been more indictments of shippers and passengers for soliciting and receiving rebates or other preferential treatment, false billing of shipments, filing false claims and violation of the anti-pass act, than of the railways. The same statement is true for the year 1916, according to the recent annual report of the Interstate Commerce Commission to Congress. Between November 1, 1915, and October 31, 1916, 54 indictments were returned for violations of the act to regulate commerce and the acts supplemental thereto. Of these, 22 indictments were against carriers or carriers' agents and 32 against shippers, passengers or interested parties other than carriers. When this is compared with the record for previous years it is found that according to the commission's annual reports the total number of indictments against carriers or carriers' agents beginning with the year 1908 has been 214, while the number of indictments against shippers, passengers and others has been 299. The indictments for each year as shown by the Interstate Commerce Commission reports have been as follows:

	1916	1915	1914	1913	1912	1911	1910	1909	1908	Totals
Against carriers or carriers' agents....	22	22	20	28	34	29	25	16	18	214
Against shippers, passengers and others.	32	50	38	33	54	26	19	19	28	299
Joint indictments.....	..	..	..	..	5	7	..	..	..	12

It is also of interest to note in this connection that the total number of indictments for violations of the interstate commerce law was less in 1916 than in any other year since 1910. While there are still many indictments against railways for granting rebates, concessions and discriminations, which, of course, involve also the shippers who receive the rebates and concessions or the advantages of the discriminations, most of these cases in recent years have been of a technical nature. Among them are included cases involving failure to assess and collect lawfully published demurrage charges. There have also been some prosecutions for failure to file tariffs and to post tariffs on time. The indictments against shippers, aside from those in cases in which both the shippers and carriers were prosecuted, include many instances described in the commission's report in which shippers have endeavored to secure rates lower than the lawful rates by false representations as to the contents or weight of shipments, or in which they have filed claims against carriers for damages to shipments greater than the amount of the actual damage or increases where no damage was actually sustained.

Referring to the practice of false billing, the commission says that "investigation tends to show that in those sections of the country where several cases have been prosecuted recently for false billing there has been a noticeable tendency on the part of shippers generally to describe their shipments accurately. In certain other sections of the country where prosecutions have not been undertaken recently and where investigations are now being made it appears that false billing is more prevalent." The commission says that many instances of false billing are the result merely of carelessness, but that where the false billing has been frequent and has resulted in profit to the shipper it is difficult to escape the conclusion that the false billing was wilful. It is apparent, however, that the commission's efforts have brought home to a considerable number of shippers the fact that the interstate commerce law is a two-edged sword which may be used to punish wrongdoing on the part of shippers and that the carriers are not the only parties in need of correction.

RENEWED MENACE OF A STRIKE

AT the time this editorial is written the danger of an interruption of transportation by a strike of train service employees is again hanging over the country. The nation is on the verge of and probably will soon be involved in the most gigantic war in history. An eight-hour basis day law was jammed through Congress six months ago and its constitutionality is now under consideration by the Supreme Court. In other words, the train service employees are threatening to strike at a time of the greatest national peril and also at a time when the question of their wages and conditions of work is pending before the highest tribunal of the nation.

Officials of the federal government and many other persons profess surprise at the turn things have taken. There is no reason for surprise. The leaders of the brotherhoods are pursuing the same policy they have consistently pursued for years. In an editorial in its issue for March 2 this paper when commenting on the fact that Congress was preparing to adjourn without having passed any legislation to prevent a railroad strike, anticipated what is now occurring and gave its reasons. We said at that time, "it is apparently one of the main principles of action of the leaders of the brotherhoods that they shall seize upon the time when the necessities of the railways and the public are the greatest to order strikes on the assumption that while this may be harmful to others it is the course which is most likely to achieve success for the brotherhoods," and that the adjournment of Congress without the passage of any legislation meant, "that the nation may be facing both embroilment in the greatest of all wars, and the paralysis of its transportation system by the greatest of all strikes." But all such warnings from those in touch with the situation have been ignored by the government, and especially by Congress. The leaders of the brotherhoods deliberately waited until Congress had adjourned and legislation that would restrict their freedom of action had been rendered impossible; then they immediately renewed their threat of a strike.

Their action is indefensible. With transportation paralyzed the nation could no more effectually engage in war than a man with his arms tied behind him could participate in a pugilistic contest. The leaders of the brotherhoods have assured President Wilson that they will do nothing to interfere with the prosecution of a war, but they cannot strike under existing conditions without interfering with all preparations for war, and to interfere with preparations for war is to interfere with its prosecution. There may be people who will claim that conditions being what they are the railways ought to surrender to prevent a strike. But the developments of the last year have shown that no surrender by the railways would do any permanent good. It would be accepted by labor leaders as a vindication of the policy of relying exclusively on force, and within a few months the roads would be threatened again with a nation-wide strike either by these same men or by some other class of their employees. The railways repeatedly offered to arbitrate. When a law to compel them to grant most of the demands of the men was jammed through Congress without any hear-

ing they exercised their right to carry it into the courts but at the same time co-operated with the Government in trying to hasten a decision. Having pursued a reasonable and fair course thus far it would seem there is nothing left for them to do but stand fast, and, if necessary, fight the brotherhoods to a finish.

RAILROADS AND NATIONAL DEFENSE

THE railroads of the country have been quick to respond to the general call for placing the country in a state of preparedness, not only for the present emergency but for any which may arise at any time. While industries of all kinds were prompt in offering their facilities to the government when the present international situation reached an acute stage a few weeks ago, the railroads have been able to be the first to tender to the Secretry of War a perfected organization for extending their co-operation in plans for national defense and to hold a meeting with the officers of the War Department at Washington and arrange a definite plan of action. That they were able to do so is due not only to the prompt and energetic action of Daniel Willard as chairman of the committee on transportation and communication of the Advisory Commission of the Council for National Defense, which has since won recognition by his election as chairman of the commission, but also to the fact that they had a medium for concerted action in the American Railway Association, which had made a good beginning in the work of its Special Committee on Co-operation with the Military Authorities, formed last year to deal with the mobilization of the National Guard. The executives of the individual railways also deserve commendation for their hearty and prompt response to the request for their co-operation.

The organization of the new Special Committee of the American Railway Association on National Defense, of which President Harrison of the Southern is chairman, to work in connection with the Council of National Defense and its Advisory Commission was described in a recent issue of the *Railway Age Gazette,* and the plans outlined at its first meeting in Washington last week are described elsewhere in this week's issue. The fact that the officers of the War Department had invited the co-operation which was extended to such good effect by the railways last summer and the prominence given to the transportation problem in the law creating the Council for National Defense, indicate in themselves a recognition of the vital importance of transportation in its relation to military operations which has not been fully appreciated on some previous occasions. At the time of the Spanish-American war there was a disposition on the part of the military authorities to ignore the transportation question. Railroad officers were not only called upon to give service without having been consulted in advance but were made subordinate to even minor military authorities and were then criticized because everything did not work smoothly. The important part played by railroads in promoting the efficient handling of armies and supplies in the European war, which has been carefully observed by the officers of our War Department, has demonstrated the need for treating transportation as a highly specialized technical branch of the art of war, to be managed by its own experts, subject to the highest military authority, but not left subject to the orders of subordinate army officers entirely ignorant of the subject.

During the experience in connection with the handling of the National Guard an understanding was reached between the railroads and the War Department by which its wishes were conveyed to representatives of the American Railway Association and by them communicated to the proper railroad officer, and while there were a few complaints by some political colonels of militia who expected to get Pullman cars for their men merely by pushing a button, such criticisms were laughed at by the regular army officers and the work of the railways and of the special committee elicited the highest praise from the War Department. The transportation part of the mobilization to the border was handled so efficiently that it has been decided to follow the same plan again in case another movement of troops becomes necessary, working through a central organization at Washington with representatives at the various departmental quartermasters' headquarters and in each mobilization camp, under the administrative direction of the American Railway Association committee on National Defense. The committee has also arranged through its four territorial sub-committees, to work in co-operation with the department commanders in making a thorough study of the various questions pertaining to the location of mobilization and concentration points in their relation to transportation facilities, which includes the question of terminals, and through other sub-committees to study questions pertaining to equipment and to tariffs and classifications governing the handling of military stores.

"FULL CREW" LAWS AS MEASURES OF SAFETY

THE New Jersey Bureau of State Research, working under the auspices of the New Jersey State Chamber of Commerce, has reported that "full crew" laws, which are costing the railroads of the country four or five millions yearly, have not reduced accidents and casualties to any appreciable extent; the laws are the useless and unreasonable measures that the railroads declared in advance that they would be. The conclusions of the bureau are based on careful studies of the laws and their results (so far as ascertainable) in 22 states; and the figures on which the calculations are based have been published in a report so that every reader can examine the whole statistical field for himself. The final conclusion of the investigator is that 4,095 casualties to persons in one year, or 2.4 per cent of all casualties reported by American railroads to the government in that year (1915) *might possibly* have been wholly or in part prevented by increasing the number of men in the train crews.

The conservative Evening Post, of New York, agreeing in general with the course of the New Jersey investigator, and admitting the illogical character of "full crew" legislation, finds fault with the conclusion (that only 2.4 per cent of casualties could have been prevented by a full crew law) because the percentage is suspiciously exact! The fear is expressed that anti-labor-union prejudice has colored the figures.

The Evening Post's criticism is well taken; the figures do wear an appearance of accuracy which is not justified by any facts. But the trouble is that the accident statistics do not afford any positive information as to the effect of full-crew laws, no matter how they may be viewed. The figures given by the New Jersey bureau are as illuminating as any that can be extracted from the published reports, but there is no sort of illumination in any of the statistics. None of the items in any of the accident reports of any state throw any light on the question whether an increase in the number of men in a train crew would prevent any of the accidents. And the report says as much, if read with care. In various places it mentions a very small percentage as possibly affected by size of crew; but then adds that nothing is known as to whether any of the items included in the small percentage were actually affected. Whether with small crews, the killed and injured were numerous; or with large crews they were less numerous, is a question still left wholly in the dark. Whole pages of comparisons which seem to show the picture "before and after" the adoption of a full crew law, prove on examination to show nothing at all. The New Jersey Chamber of Commerce is to be commended for making a deep study, and the work has been done by an unprejudiced

hand; but the only good done by printing the data is to show its worthlessness. There are a dozen pages of fine print giving hundreds of items of accidents to trainmen and others in New Jersey; but these pages are useful only to show that the investigator has honestly explored his field. To railroad men and all impartial investigators this condition was already well known. This report treats the "full crew" laws with respect, and discusses the issues in a dignified way; but to the reader who reflects that every one of these laws was conceived in fraud and was passed by the votes of cowardly legislators, this dignity comes near to being tiresome.

The Evening Post, in its academic way, surprised at such a one-sided report, endeavors to find some fact or argument on the other side. It conjectures a trainman being injured because he is hurried in his work; and that brakes may be faulty because they are not examined often enough. These are cited as examples of the reasoning by which the extra man might be justified. But if considerations like these are to be employed to justify this law we must show how the extra man prevents the hurrying; or how he can improve the brake inspection. In point of fact, he does not do either.

Actually, the extra man has done no appreciable good. No labor union has claimed any tangible benefits. But let us look at the theoretical (though sophistical) grounds on which the alleged benefit is predicated. The law requires a third brakeman on a through freight; some switching may have to be done by this train at a way station. One man being left at the hind end to flag, the switching must be done by the conductor and one brakeman. Now, the second man may perhaps reduce a five-minute job to four minutes or three minutes. That is all. If, without his help, the conductor and the single brakeman are liable to hurry, and by hurrying, introduce danger, what is the natural and reasonable remedy? Simply the same as in any other circumstances, circumstances that occur in everybody's work every day; the impulse to hurry unduly must be resisted. The absurdity of paying a man three or four dollars a day to save a few minutes' time is too patent to justify mentioning it. On some days a train might suffer several such petty delays; and there would be an actual loss; there would be a real benefit in having another helper; but on the very great majority of days there would be no delay at all which could be prevented by having a helper.

As to inspection, that is not a trainman's duty, except that every trainman should at all times keep his eyes, ears and nose alert to detect abnormal conditions; but if the danger of failure of brakes or trouble from brake-beams or unlubricated journals is to be met by increasing the number of trainmen there is just as good an argument, on long trains, for three, four or six men, as for one man. Indeed, this point of watching for occasional dangerous conditions is the one on which the whole question ought to be fought out. This duty is the one legitimate reason for proposing to increase the number of men on freight trains. All other arguments can be demolished by a schoolboy. But there are a dozen ways in which the New Jersey railroads could have spent their $1,250,000 and got for it ten or a hundred times as much improvement, in safety of persons and property, as they could get by putting on additional trainmen. The Evening Post objects that there is no certainty that the roads would actually spend the saved money in the promotion of safety. It is true that railroad officers, in their quest for safety, sometimes go wrong and spend their money wastefully; but that is not a very important issue just now, for the railroad officer does not have to do much planning in this direction; the State and Federal governments do it for him. They use up his money so rapidly that he can be trusted not to spend any of it for any purpose—for safety or otherwise—unless he is dead sure that the expenditure is absolutely necessary and important.

DELAWARE, LACKAWANNA & WESTERN

IN every line of the Delaware, Lackawanna & Western's 1916 annual report there is evidence of the wisdom shown in the development of the property and the benefits that accrue to the stockholders in a time of unusually heavy business, and the benefits derived by shippers in a time of heavy business because of this forehanded development of the property. The Lackawanna, unlike the Pennsylvania, has physical facilities for handling a very much larger volume of business than is offered in normal times and, unlike the Erie, it has an organization capable of bearing a very much heavier load of work than it is called upon to perform in normal times.

The result was that the Lackawanna, carrying 26 per cent more tonnage of merchandise freight, 16 per cent more tonnage of coal and four per cent more passengers in 1916 than in 1915, could have handled, President Truesdale says, more business than it did if deliveries could have been accepted by exporters at New York and by connecting railroads. In 1916 total operating revenues amounted to $51,581,000, an increase of $6,794,000, or a little over 15 per cent as compared with 1915. The ton-mile rate received for both coal and merchandise freight was slightly lower in 1916 than in 1915, the rate being 8.19 mills for coal in 1916 and 8.43 mills in 1915 and for merchandise freight 7.07 mills in 1916 and 7.16 mills in 1915. The lower coal rate was caused by an order of the Pennsylvania railroad commission reducing coal rates.

The Lackawanna is a remarkably economically managed road in normal times, but neither officers nor men are pushed as they are on a good many other roads. Under normal times even operating officers do not work "nights and Sundays." In 1916 total operating expenses amounted to $31,941,000, an increase of $4,184,000, or 15.07 per cent. By far the largest increase was in transportation expenses. These expenses amounted in 1916 to $17,168,000, or $2,945,000 more than in 1915. This was notwithstanding an increase of 12 per cent—82 tons—in the average revenue trainload. In 1916 the trainload was 770 tons. The fact that the Halstead cut-off was in operation during the whole year probably helped in the better showing per trainload, but the fact that this cut-off eliminated some very expensive operating districts makes the large increase in transportation expenses all the more striking. Fuel costs per ton were higher, there were many increases in wage scales of station employees, congestion at terminals necessitated overtime, and the heavy pressure under which everybody was working which contributed to the increase in the loss and damage and injuries to persons, payments, all increased transportation expenses unduly.

Maintenance of equipment cost $7,617,000 in 1916, an increase of 11 per cent, due in part to the higher wages which it was necessary to pay shop men to hold them, and in part to the large increase in the cost of materials. The following table shows the cost of repairs per unit of equipment in the two years:

	1916	1915
Per locomotive	$2,862	$2,565
Per passenger train car	510	459
Per freight train car	73	64

The Lackawanna handles its depreciation of equipment account as follows: The depreciation is charged against operating expenses and this sum is credited to replacement of equipment. Against this account there is debited the cost of equipment purchased and built. In 1916 $2,270,000 was charged for depreciation, including value of scrap and usable material from equipment sold or dismantled, and the total cost of equipment bought and built and additions to equipment was $2,987,000. Since the Interstate Commerce Commission rules for charging for depreciation have been in effect, the Lackawanna has bought equipment costing $4,430,000 in ex-

cess of the total depreciation of the company's equipment during the same period.

Only three per cent more was spent for maintenance of way in 1916 than in 1915, although the increase in wage scales varied from 25 to 33 per cent. Labor was so scarce that maintenance work had to be held down, which, however, on the Lackawanna was a comparatively easy matter. So great a part of the structures are now concrete that, except for renewals of ties and rails, there is comparatively little renewal work to be done. Not by any means as many ties and rails were laid in 1916 as in 1915.

Notwithstanding the increases in expenses, the Lackawanna had a surplus after paying 20 per cent dividends, of $7,756,000, comparing with $2,519,000 in 1915. A total of $1,702,000 was spent for additions and betterments. No securities were issued during the year and the company had on hand at the end of the year $4,139,000 cash, comparing with $1,278,000 on hand at the beginning of the year.

It will be recalled that at the beginning of 1916 the coal roads were facing a possible strike of anthracite miners. The old agreement with the miners expired March 31 and a new agreement was negotiated under which wages were advanced and the hours of labor reduced from nine to eight. This new agreement dates from April 1, 1916, and runs for four years. The contract under which the railroad company sells its coal at the mine's mouth to the Delaware, Lackawanna & Western Coal Company was changed so as to pass along to the sales company the increase in cost of coal due to the new agreement with the miners and this increase was in due course passed along to the consumers of coal.

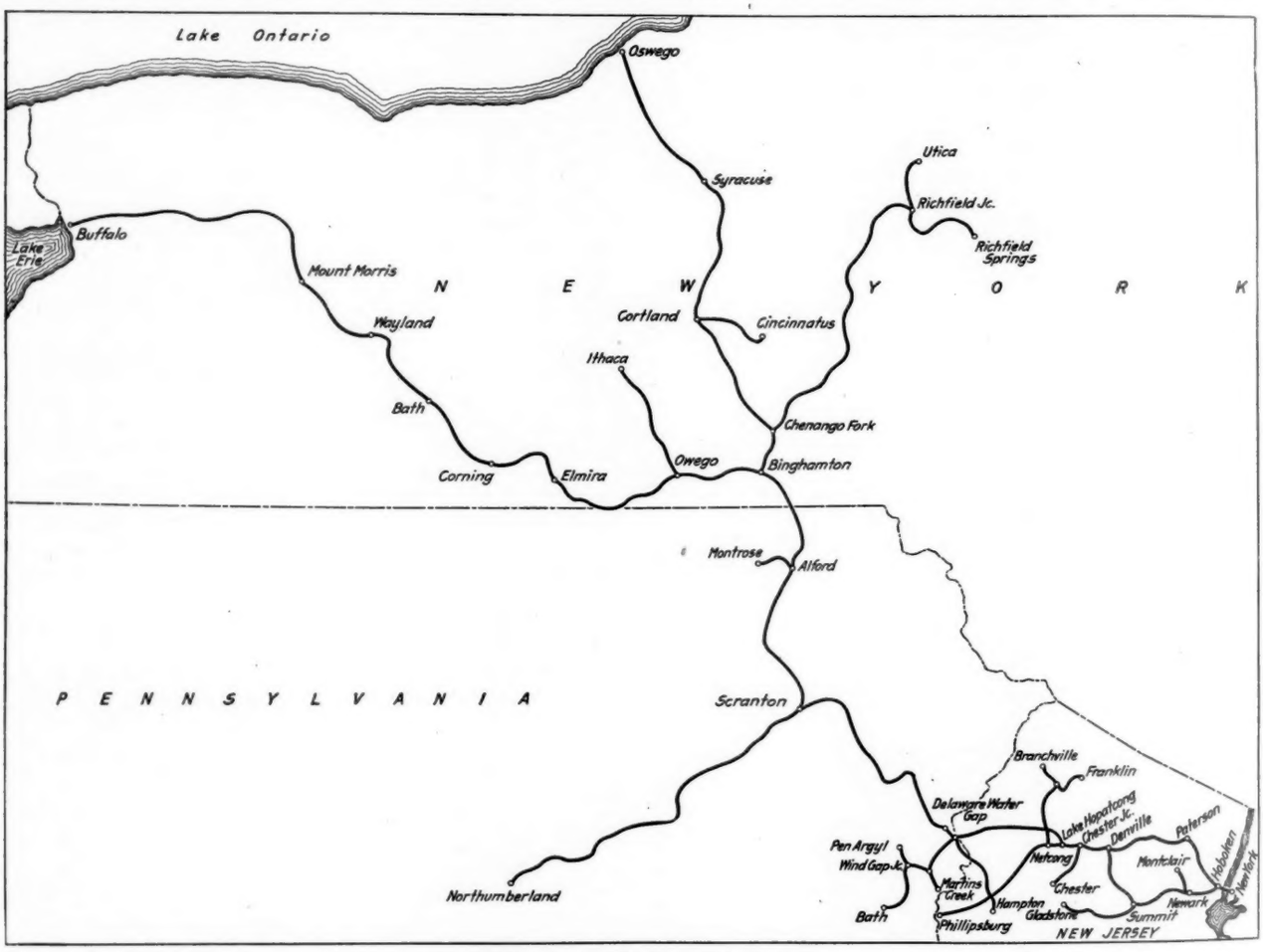
The following table shows the principal figures for operation in 1916 and 1915:

	1916	1915
Mileage operated	980	980
Coal freight revenue	$14,475,244	$13,364,007
Merchandise freight revenue	23,229,865	18,742,617
Passenger revenue	8,674,863	8,218,316
Total operating revenues	51,580,899	44,786,731
Maintenance of way and structures	4,819,787	4,662,311
Maintenance of equipment	7,616,684	6,869,900
Traffic expenses	915,301	920,556
Transportation expenses	17,167,743	14,222,297
General expenses	1,054,746	942,000
Total operating expenses	31,940,974	27,756,947
Taxes	2,517,883	2,115,334
Operating income	17,114,593	14,912,945
Gross income	24,647,158	19,916,518
Net income	16,200,148	10,963,140
Dividends	8,444,080	8,444,080
Surplus	7,756,068	2,519,060

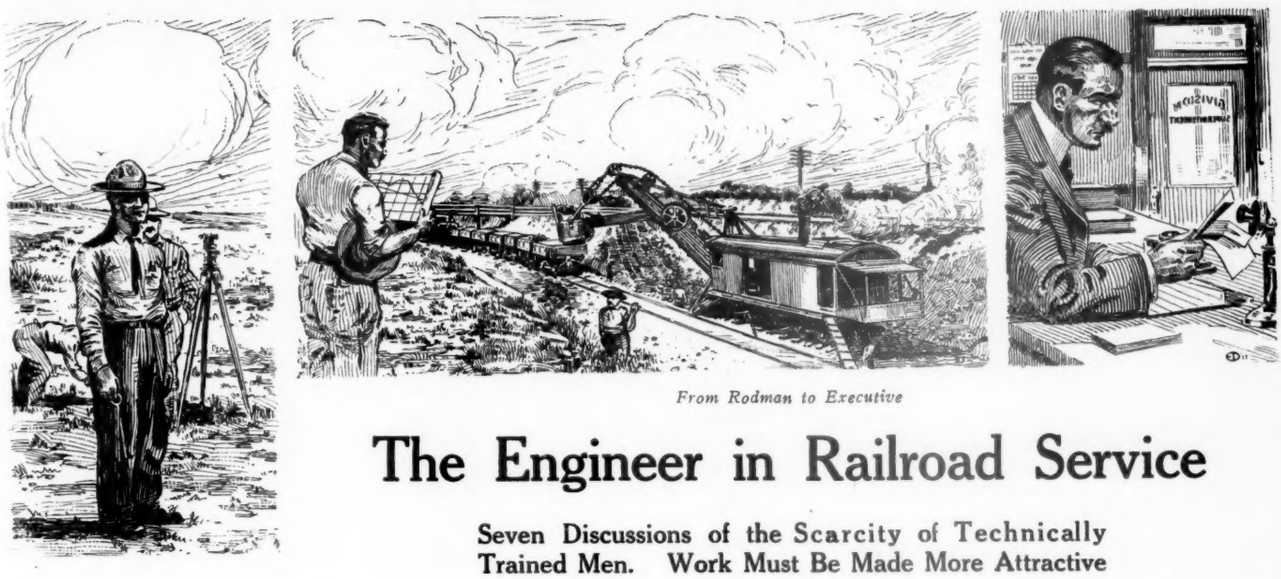
NEW BOOKS

Proceedings of the Railway Storekeepers' Association. 212 pages. 6 in. by 9 in. Published by the association, J. P. Murphy, secretary, Box C, Collinwood, Ohio.

This is the official report of the thirteenth annual meeting of the Railway Storekeepers' Association, which was held in Detroit, Mich., May 15, 16 and 17, 1916. It contains a discussion on piece work, and reports of committees relating to the following subjects: accounting, marking of couplers and parts, scrap and scrap classification, filing correspondence, standardization of tinware, storage of ties, standard buildings and structures, reclaiming old rails, reclamation, handling of company material, stationery, lumber, and rails.



The Delaware, Lackawanna & Western



From Rodman to Executive

The Engineer in Railroad Service

Seven Discussions of the Scarcity of Technically Trained Men. Work Must Be Made More Attractive

AN editorial entitled "The Engineer in Railway Service," which was published in the issue of the *Railway Age Gazette* of January 19, discussed the reasons for the relatively small number of engineers who are now entering railway service. This editorial has aroused a great deal of interest in this subject among railway men and college professors alike, and we have received a number of letters, commenting on it, several of which are published below.

TRAINING AN ENGINEER

By R. N. Begien
Chief Engineer, Baltimore & Ohio.

I have read the article in the *Railway Age Gazette* concerning "The Engineer in Railway Service." To my mind, the principal points are as follows:

(1) Why does not the young engineering graduate enter the railway service?

(2) Why is there a prejudice against advancing engineers in the operating department of some railways?

A few years ago the alumni magazine of a prominent college made a canvass of its graduates to find out why they did not enter the railway field. My recollection is that the replies indicated that the work was too hard and the pay too small. In this connection it may be of interest to note the final report of the special committee appointed by the American Society of Civil Engineers to investigate the conditions of employment and compensation of civil engineers, submitted November 15, 1916, and published in a recent issue of the proceedings of the association. In this report it is noted that the compensation of engineers in the employ of railroads is below that of contractors, consulting engineers and private companies. This is true because the employment is less steady than on railroads. Those ranking lower than railroads are the national and state governments and technical schools. These general conditions are known by the public through such reports as the above and the drift of engineers has been towards industrial work, consulting engineering and contracting.

Railroad life is exacting and a broad training is needed to meet the high standards required, especially under present conditions. The compensation is not always attractive as compared with that received in general business, especially in the lower positions. The construction branch of railway engineering usually has a future in only one direction and that is railway construction. The members of the organization get no training in any other branch of the service. The maintenance of way branch of railway engineering has more future to it, on account of the fact that its employees are a part of the operating organization. Maintenance of way engineers deal directly with the division superintendent and their capabilities become known to him.

However, it should be remembered that the maintenance engineer receives no training in the principal business of the railroad, that is the transportation of cars and freight. Incident to transportation are other essentials, such as dealing with organized labor, handling of discipline, knowledge of locomotive performance, and the general organization of the railroad to bring about the successful transportation of freight. It is not strange that on most roads men are selected for the position of superintendent who have had some training along these essential lines. In the organization of a division each member of the staff must have special training in the department over which he is the head.

If the superintendent has been brought up as a train despatcher, it is necessary for him to have a man who has been educated in the train service for a trainmaster, a civil engineer for a division engineer, a locomotive engineer for a road foreman of engines, a mechanical man for master mechanic, etc. He will also have a competent chief despatcher, but it is probable that he will feel less need of him than of the other members of his staff, unless he is a first-class organizer himself, in which case he will probably be more particular to get the best possible chief despatcher.

It has often been charged that a maintenance of way engineer would delay trains in order to do maintenance work; in other words, he would delay the principal object of railway business in order to accomplish the specific work of his branch. The superintendent should educate him not to do this rather than censure him for doing it. It is true that some engineers have little business instinct. They have not been trained in business, but if they fail in business management, it is not to be blamed on their training as engineers but on their lack of business training. The accusation has been made that some engineers are extravagant. It is not remarkable, however, when it is remembered that the failure of an engineering structure will often put its designer out of business for all time. Proper training, however, would change the point of view of the kind of man that would be promoted to an executive position.

There is another important qualification for the position of division superintendent which some engineers lack. In carrying on the business of transporting freight it is neces-

sary that action be taken quickly and without hesitation. The training of an engineer is principally along the lines of deliberation. They are accustomed to giving considerable thought to any particular subject before taking action. While this is not opposed to the requirements of executive work, it is necessary that an executive think quickly and act quickly. Quick decision is needed in operating work, but there is no reason why an engineer should not acquire this important adjunct.

It is my belief that as large a proportion of engineers are qualified, for executive positions as can be secured from any other branch of the service, and if qualified in the essentials they usually advance beyond the lower positions. If the superintendent is an engineer, he should have a staff composed of experts in all the lines in which he is not personally experienced.

It is my opinion that engineers should be trained definitely along lines that will make them proper executives. Their technical education is of advantage in dealing with municipalities and public service commissions. It is of special value in analyzing the problems that arise in railroad operation, many of which depend on technics for a solution. As between men of equal ability an engineer should have some advantage over the others, and I think the door should be wide open and left so—both for ingress and egress.

THE RAILROAD AT FAULT

By Wm. G. Raymond
Dean, College of Applied Science, State University of Iowa.

In one paragraph of your editorial you say, "However, the fault is not entirely with the engineers. If they are employed successfully on some roads, and it must be admitted that they are, the conclusion naturally follows that the roads on which they are not considered to have made good must be at least partially at fault." And you go on to suggest that on these roads the engineers have, perhaps, not been given proper opportunities. The truth, as I see it, is that the fault is wholly with the management of these roads—in the lack of breadth of view of the employing and supervising agency. I think it goes without saying that, of two men of equal ability, one with college training and one without, the college trained man is the better. If this is not so, it must be admitted at once that the college training is absolutely useless. If college trained men do well on some roads and fail to do well on other roads, since it is practically certain that in the long run an equal number of good, mediocre and poor men will apply for and obtain positions, assuming that the roads which have had difficulties have not been averse to trying the college men, it must follow that the lack of vision of the superior officers and their failure to develop sound policies under which their men are handled—the chaff weeded out and the wheat retained—are responsible for their difficulties with the college trained men.

The Pennsylvania Railroad has a well outlined and defined course of procedure for the young men fresh from college. Very few roads have any such organization. The young man from college is commonly employed as rodman or draftsman under a superior officer, who is not a college man, who takes no interest in the men below him, who is jealous only for his own position, who is quite generally criticising his own superior officers and thus setting a poor example to his subordinates, who never will rise beyond $1,500 or $1,800 a year himself, and who will prevent, so far as he can, the advancement of his subordinates. There is nobody higher up who knows what the young fellow is doing, unless by chance sometime a young man falls under the observation of the superior officer.

This is no fanciful or unusual picture that I have been drawing. I have, in the past, tried to place students of mine with railroads and I have succeeded but I have not had much success recently, not because the railroads were unwilling to employ them, but because the young men did not care for the service. In recent years I have not made much of an attempt because the future for the reasonably bright and intelligent college graduate entering railroad service is not attractive. A few years ago I placed three men of one class with a prominent eastern railroad. The situation there was exactly as I have pictured above. All three of the men left the service of the company of their own accord, and, if I remember rightly, before the expiration of a year. One of them stayed in railroad work, securing better service and recognition on another road, and the other two went into other service where they have been successful.

The railroads can secure and train intelligent young fellows, who have no college training, to do the work of chainmen, rodmen, and so on up to instrument men, and, in exceptional cases, they may be trained for higher positions but in the lower positions they can do the work and do it well.

There are lots of men who will work for comparatively small salaries and who are for the most part satisfied with very modest salaries in the highest positions to which their intelligence and education permit them to aspire. The salaries, therefore, of all these subordinate positions, through which the college trained man must go, are kept relatively low, and the young college man who enters railroad service without previous experience and under superior officers who are not interested in his advancement, sees an altogether too long a stretch of years before him before he can hope, except by accident, to secure even the modest salary of $2,000 or $2,500 per year. In other service into which he may go, he is not so limited and as a rule his advancement is as rapid as his merit will warrant. A recent graduate in mechanical engineering with a few months' experience was offered $65 in the drafting room of a large railroad, and $80 with good opportunity for promotion with one of the large companies that supply the railroads with materials.

It is not only in the civil engineering service of the maintenance of way departments of railroads that college trained men are needed and not found. They are even more needed in the motive power department. A few roads have organized systems of employment and promotion, which really offer opportunity to graduates in mechanical engineering, but the majority of roads have not as yet done anything of this sort. On one road with which I am familiar and which has tried to secure college men for its work, the result has been unsatisfactory because the railroad is controlled by the unions, and the necessary apprenticeship course has not been so outlined as to free the college man from the difficulties that a non-union man experiences.

I think the whole story is in the failure of railroads to establish any proper system of employment and promotion, and I believe that this is true in spite of the criticism that you suggest of the colleges, that they have not kept pace with the changes of railway operation and have not revised their courses of instruction to prepare their students for the work they will be called upon to perform in railroad service.

I teach most of the railroad work that is taught in the civil engineering course in my own school. My own experience in railroad work was largely on location and construction work. It is the work which is, of course, of most interest, but we have men in our department whose experience has been almost wholly on maintenance of way

and has been quite extensive, yet I would not think of introducing courses in the routine of maintenance of way into an undergraduate course in civil engineering. The introduction of such courses would be wholly at variance with my notion of what a four year college course should be. There is not the time in such a course to teach more than the fundamentals of science applied to engineering. There is much yet to be done in this country in the improvement of railroad grades and alinement, and the teaching of the fundamentals of economics of railroad location seems to me to be a proper function for the school. To take up time in the four year college course to teach a boy when and where to use manganese steel frogs and how many inches there should be in the space between the guard rail and the main rail, or all the working details of an interlocking plant, or all the routine of the office records of a maintenance of way office, or in fact any of the rest of the details that he should learn in his apprenticeship, just as the mechanical engineer will have to learn the details of the shop methods of the plant to which he goes, would be to my mind a criminal waste of time, that should be used to teach the boy to think, to study, and to reason with correct mechanical principles as his tools. To my mind the school is not the place to teach the details of practice, but the fundamentals underlying those details, and if the young man is thoroughly grounded in these, he will make fewer mistakes in his selections of details, will determine fewer of them by trial methods, and will save his employer time and money in getting more quickly to the desired final result than if he is obliged to learn how wholly in the school of hard knocks.

When the railroads are ready to take college graduates at what they are and what they ought to be expected to be, and devise for them proper apprenticeship courses with greater or less regularity of promotion for the mediocre and opportunity for the more intelligent to use and profit by their superior ability, and pay them what they can earn in equally attractive and promising service of other kinds, they will have no serious difficulty in securing men who will do credit to themselves, and to the institutions from which they come, and who will be of value to the roads that employ them.

SOME CAUSES OF FAILURE

By a General Superintendent

I fully agree with the first paragraph of the editorial which states that "At no time in the history of American railway development have the roads been confronted with such a variety of problems requiring a high degree of scientific knowledge and ability as now," and with the sentence in the fourth paragraph, which reads as follows: "In view of such a record it is well to inquire why this feeling of opposition to technically-trained engineers exists on some roads."

There are five different and distinct reasons why civil engineers have not been successful on some roads.

First. There is no precedent on the road on which a young engineer is employed that will lead him to believe that he will be promoted to have charge of transportation and finally be in full charge of the operation of the road. This will not apply to the Pennsylvania Railroad and others that have promoted engineers into the various branches of the service; but it refers to those roads which have not started this practice and where it does not, therefore, occur to the young engineer that there is an opportunity for him. As a result, he does not train himself or make his superior officers think that he is qualified for such promotion. He is satisfied to accept his usual advancement in the engineering department until he ultimately becomes chief engineer, and feels that he has reached the goal of his profession in railway engineering.

Second. Loyalty to the profession. There are many engineers who feel that if they are promoted from the position of engineer maintenance of way to that of superintendent they will lose their identity as engineers by branching off into another line of service in which successful men with only a common school education have sometimes excelled them. This loyalty to the profession has probably kept many men who might have made successful operating officials from even desiring promotion in that direction.

Third. Assuming that the two barriers mentioned above do not exist and that the engineer is anxious to become an operating official, he sometimes fails because the methods of handling transportation problems are so different from those connected with his past experience in handling engineering problems. What I refer to more particularly is the slowness of decision peculiar to engineering work which is along conservative lines and requires deep thought, study, planning and the manipulation of figures. There he can give a day, two days or even several weeks to arriving at a decision as to the proper thing to do, whereas in the transportation game a quick decision is absolutely necessary and his mind must be so trained that when a transportation problem arises an answer can be given right off the bat.

Fourth. The experience of the young technical graduate when he starts on a railroad is not conducive to his being democratic in his feelings towards workers in other departments getting more salary than he is. For instance, he comes to work as a chainman on an engineering corps, is immediately given an annual pass and gets that arrogant feeling about it, well-known to any one who has ever possessed an annual. He at once figures that he is a railroad official; and, on his third or fourth trip on a passenger train on the division on which he is employed, he is surprised to find that the conductor will even bother him to show it, preferring that the conductor would merely say "Good morning, Mr. ——," and pass on. He advances through the various grades of promotion in the engineering line until he is engineer maintenance of way and is finally promoted to the position of superintendent. This autocratic manner he has schooled himself to have is always a good signal for a failure when he begins to handle transportation men.

Fifth. The preference to be a specialist may be the cause of many brilliant engineers failing to become operating officials owing to their engineering experience having been good, their work thorough, their promotion rapid so that their salaries soon get beyond the salary of a division superintendent, and they prefer then to follow on in their profession and specialize in bridge design, building construction, grade reduction and railroad location rather than to turn their attention to the general operation of a railroad.

The above reasons, I believe, answer the question as to the feeling of opposition to technically-trained engineers which exists on some roads.

In the latter part of the editorial the neglect of the universities to keep pace with the changes in railroad conditions is mentioned and the suggestion is made that the colleges revise their courses of instruction to prepare the students more directly for the work they will be called upon to perform. I have always felt that my own university training was only a foundation for what I might want to do in the future, and I believe that technical universities sometimes make a mistake by having too many departments of engineering instruction.

I have always held that if a student lays a heavy foundation at the University, when he goes out into the world, his training at the University will enable him to work out his new problems. This was very forcibly brought to my attention about 20 years ago by a young man who is now chief engineer of one of the large trunk lines. Shortly after he began

work with a railroad he was given a level and a rod and sent out with an assistant with instructions to set ballast stakes. He remarked that he did not know a "ballast stake" from a "beefsteak"; but, with the knowledge he had previously acquired at the University and the application of common sense, he figured the matter out and set the stakes exactly as desired without assistance from any one; therefore, I do not feel that the Universities are much to blame for the failure of the engineer when it comes to the operating end of railroading.

Generally speaking, it is the head that counts; and, when an engineer is considered by his superior officers for future promotion, there are many things to be considered other than his education and previous training, such as his ability to handle men, his quickness of decision (provided most of his decisions are right), his ability to get on with other officers, and other things that go to make an all-around man. All this rests with the man himself and his promotion into the transportation department depends upon his own energy, his loyalty to the railroad's interests and his ability for future promotion.

MAKE THE SERVICE MORE ATTRACTIVE

By W. K. Hatt
Professor of Civil Engineering, Purdue University.

I do not know anything about the feeling of railway officials toward technically trained men entering in the corps of engineers of railways, but I do know that there has been an increasing reluctance on the part of our graduates to enter railway service. Fifteen years ago the average graduate looked ahead to railway fields for employment. Gradually and for reasons which were not plain, students about to graduate, with previous experience, have been seeking other fields of employment. Consequently the maintenance-of-way corps of the various railroads are likely to be recruited from the lower third of the graduates with respect to ability and experience. Professors recognize the fact that service on railway corps gives the very best preparation for the work of a civil engineer, and have been striving to turn the tide.

This reluctance was not determined by the small entrance salary, but by the general experience of railway maintenance engineers which has been that after ten years of service men of good ability and faithful in the performance of their duties were earning a very inconsiderable salary, much smaller than a man had reason to expect in other fields of civil engineering.

Then, too, there was a period of years in which these younger graduates, earning perhaps $60 a month, were furloughed for a period of two or three months, because there seemed to be no money to maintain the corps. One can hardly blame thoughtful young men, ambitious to settle in life and to provide reasonable comforts for themselves and families, from avoiding entrance into what seemed to be a blind alley.

It seems to me that it is up to the higher officers of our railroads to stand firm for the interests of the engineering organization. Certainly it is not to the interest of railroad operation that this important branch should be recruited from those engineering graduates of less ability, less initiative, or less experience.

The faculty of the School of Civil Engineering of Purdue University has always represented practical knowledge of railway engineering, and has given an undue amount of time to railway location, construction and maintenance. The efforts of the members of the faculty in direct charge of the railway course, to turn the attention of the students to railway engineering, have been to overcome a state of mind of our students created by information from graduates in the field of service. Let the railroads make this service attractive and the colleges will do their part.

Work in the federal valuation of railroads was very attractive to engineering graduates for a time, but stories soon came back regarding this class of employment, and its opportunities, and students are at present turning their faces in another direction.

It appears to me that this liveliness of our present generation of students is a salutary condition. Just as soon as engineers will cease to be satisfied with their position in the world of affairs and refuse to accept the service that does not provide opportunity for normal professional development, we shall have a remedy for the condition complained of in the recent meeting of the American Society of Civil Engineers.

THE FUTURE RAILROAD OFFICER A TRAINED MAN

By G. A. Morse
Chief Engineer, Chicago, Rock Island & Pacific

In considering this question I think the fact is to a great extent overlooked that other qualifications besides a technical education are necessary to fit a man for responsible positions in business, whether in railroad service or otherwise, and that the proportion of men endowed with these other qualifications is not necessarily much greater among technically trained men than others. However because of the knowledge that a man has a technical training, if he does not possess executive ability, more attention is paid to it than in the case of other men.

There is an inclination on the part of railroad officers without technical training, who have come up through the telegraph office, to magnify the subject of transportation and to endeavor to impress upon people the fact that there is a magic power which a man absorbs while sitting at a telegraph key which automatically makes him an encyclopedia of knowledge of transportation matters. This is but natural as every man likes to feel that the road he traveled was the road which best fits a man to fill the position he occupies. However, this idea is gradually disappearing as men trained through other departments come into prominent positions on railroads and demonstrate their superior ability to handle executive work over the old time type of executive officer. On many of the successfully operated railroads in the country today we have as presidents and operating vice-presidents, men who have come up through the traffic, mechanical, legal, purchasing, and engineering departments, as well as the operating department.

As stated in your article, one trouble in getting college men, and especially the technically trained college men, started in railroad work is that there are so many fields opening up for men of this class where they can start in at higher salaries and do not have to rough it as much as a man does who starts in the engineering department of a railroad.

There is no question in my mind but that the operation of railroads must get away from the rule-of-thumb methods followed in the early days, and get down to a more scientific and business-like basis. We have too many officers who are not business men and who are inclined to do today what the man they looked up to in their youth did, and to feel that what was a proper method at that time is a proper method today.

The cost of transportation is too important a factor in the daily life of the country to permit it to be handled in unbusinesslike and unscientific methods much longer, and unless the railroads correct this themselves we are liable to have the matter regulated by the Government through a staff of trained men. We have passed through what might be called the speculative and spectacular period in railroad construction and operation, and it has now gotten to the point where it is a straight business operation. The railroads must recognize this and in doing so the man well

trained in business methods and well trained along technical lines will, if he possesses the necessary executive ability to go with it, be sought for and placed in positions of responsibility on the railroads. The railroad company that sees this coming and trains a staff of men of this class will find itself in a much better position than one which does not do this.

THE INDIFFERENCE OF THE RAILROADS

By H. E. Riggs
Professor of Civil Engineering, University of Michigan.

The general attitude of railway officials toward university graduates has been a matter of considerable concern with the members of the teaching staff at the University of Michigan. During the early years of this engineering college a large number of the graduates went into railway service and a considerable number rose to positions of large responsibility, among the best known of whom are A. A. Robinson, formerly chief engineer and general manager of the Atchison, Topeka & Santa Fe and the late Horace G. Burt, former president of the Union Pacific. At the end of the period of active railway construction in the middle 80's members of the teaching staff at the university began to discourage graduates from seeking railway employment, and for many years no courses in railway engineering were offered in the curriculum. Beginning five years ago, courses were offered in Railway Location, Railway Construction, Railway Maintenance, The Design of Railway Structures, Theory of Accounts, Railway Accounting, and Railroad Economics, and a number of students have elected these courses each year. It is of interest to note that the students from China and South America constitute a good percentage of the classes in railway engineering.

The fact that the elections of railway courses are not larger is, in the writer's opinion, due to several things.

(1) The very considerable number of men in railroad service, many of whom are not college men, who have not advanced rapidly and who as a result are disappointed and are fault finders greatly discouraging the boys with whom they come in contact.

(2) The fact that many officials of large roads are not college men and are inclined either to discourage the employment of college men or to favor the advancement of non-graduates.

(3) The fact that engineering salaries in railway service are smaller than those paid in other fields of public utility service. An examination of the report of the special committee of the American Society of Civil Engineers to investigate the conditions of employment of and compensation of civil engineers shows (Proceedings, December, 1916, page 1,609) that while the average railroad compensation is somewhat above that of teachers in technical schools, where the man has had an experience of over 20 years it is very much less than the salaries paid by private companies.

The writer's observation is that more students are discouraged from seeking railway employment on account of the unfavorable criticism of friends or acquaintances who are in railway employ than for any other one reason. It is a marked fact that engineers and other officers of railways do not make inquiry of the colleges, when seeking men, to the same extent that men in other industries do. Students from this institution who are well trained, thoroughly capable, hard working, and ambitious, are no more likely to receive railroad employment than students of mediocre ability, with no experience and with generally poor qualifications, provided the inferior man files his application first. In other words, the railroads, perhaps less than any other large industry, take advantage of the special knowledge that has been gained of a young man by his teachers through his four years' residence in college.

The establishment of apprenticeship courses on the same basis as now in effect on the Southern railway would have the effect of attracting many of the best university trained men to railroad work. If such a system were generally adopted there would be little difficulty in securing many of the most energetic and ambitious men to enter it. Such a course does not appeal to the lazy man or to the superficial man and would automatically bar out the least desirable, from the railroad point of view, of the college graduates.

The fact that every engineering college turns out each year a large number of men who are not fitted for administrative work, who have no special liking for the railroad service and who would not make a success in it is not sufficient ground for the condemnation of all college trained men. These men, utter failures in railroad work, may succeed elsewhere, while many men who have the ability that would ultimately bring them to positions of great responsibility in railway service are turned to some other field of activity on account of lack of encouragement.

The suggestion that universities ought to recruit their faculty from men who have had experience in railway maintenance and operation is sound. It is also proper that very much less attention should be given to railway field location and some of the other courses which years ago were deemed important, than is done in some of the colleges.

The important thing in the training of a student of engineering is to give him a thorough foundation in the fundamental sciences and not to undertake specialization. No university can teach practical railroading. The railroad can take a man with a broad engineering foundation and give him the specialized work in railroad construction, maintenance and operation infinitely better through an apprenticeship course. Under present conditions the universities are hardly justified in employing in teaching positions many men who have been successful as railroad men. Their opinion of the men under them is not sought, their best students receive no more consideration than the poorest, and when the June graduating classes are being placed in positions many offers are open to the students of positions in other lines of work at more attractive salaries. These are facts, which account for the important fact that the railroads are not getting the pick of the flock, as was true years ago.

There must be cooperation between the railroad officers and the college officers. The railroad men must not expect the colleges to turn out *railroad men*. They cannot. The colleges should offer such courses as are needed to give the foundation for successful railroad work. These may well be suggested by the railroad officers. They must constitute a very small part of the total curriculum. The engineering college cannot select the men who will succeed in any particular service during the first or second year. Many boys come to school with the definite idea that they wish to enter a certain field, and show no aptitude for the work, but develop a liking for some other wholly unthought of work. Where the student makes his selection of a special line of work during his college career, it is generally after he has taken two or three years of his course and developed a liking for a certain subject.

The large majority have no pronounced leanings and take the first attractive offer. Of every hundred men who graduate from any college it is probably fair to say that not over one-fourth would be qualified to make a marked success in one special field, such as structural engineering, although many who might fail in such field have qualities which would win them a competence in other fields. This being

true, it is clear that these boys ought not to be encouraged to select a specialized line of work, certainly not in their earlier years.

THE RELATION OF THEORY TO PRACTICE

By C. Frank Allen
Professor of Railroad Engineering, Retired, Massachusetts Institute of Technology.

Your editorial on "The Engineer in Railway Service" calls attention to the "relatively small number of engineering graduates who are entering railway employ today and the smaller number who are remaining for any length of time." You suggest that "the fault is not altogether with the engineers" and on the other hand refer to "the neglect of the universities to keep pace with changes in railway conditions and to revise their courses of instruction to prepare their students more directly for the work they will be called upon to perform."

I feel sure that you err in assuming that the engineering college should "directly" prepare. The function of the engineering college is to bring to the student those things which he will get not at all, or at a disadvantage, in practice. Else why should he go there unless for football and companionship. The function of the engineering college is to provide fundamental theoretical training upon which the graduate can build after graduation.

Theory, however, can best be taught only in connection with its applications. This is the real reason for the existence of the Massachusetts Institute of Technology and the other technical colleges as distinct from the previous or old-fashioned colleges. The "connection with its applications" necessarily leads to a very appreciable amount of engineering information, but as a by-product. Many employers see enough value in the by-product to suppose that this has been the aim of the college. The theoretical foundation, however, goes hand in hand (at least it should) with the mental training, the development of the mental fiber of the student. The foundation, however, is of little use unless the graduate can find opportunity to build on it. The college then should "directly" prepare only to the extent of its by-product together with an additional minimum necessary for the graduate so that he may secure employment where he may have opportunity to build on his foundation.

If I am right, the graduate should study applied mechanics to understand the laws underlying the behavior of materials; steam, electricity and hydraulics, to appreciate the development and use of power. Mathematics and drafting are necessary as preparation. Some general training in English, history and political economy seems necessary to any man who is to assume a position of leadership. Most educators believe some foreign language very important for well rounded mental training; this rather than as a tool for reading foreign technical literature; educators differ as to the amount desirable.

In the four years of college, there is not a wide margin for substitutions of any kind in a course of the character. Information courses, pure and simple, are not approved of by most educators of engineering students, although among the strenuous courses, a short information course may sometimes be given as a dilutant. Fundamental principles and mental training must form the backbone. A real menace to engineering education today is the pushing forward of various subjects important to the engineer and whose introduction into courses of instruction is vigorously urged. Some insight into engineering law and into accounting seem very desirable and have been introduced into courses of "Engineering Administration" but without opportunity to measure results. Offhand it seems that the study of bridges and structures is not essential to the railroad operator. The study of bridges and structures (it is not a subject I have taught) is the best adapted of any I know to secure mental training along analytical lines, and the substitution of another study less effective as mental training may easily be a mistake. No college, no educator is 100 per cent wise on such matters; neither are practitioners or railway operating officials. Our best engineering colleges are turning out graduates trained, I believe, largely along right lines, but not in 100 per cent cases or by 100 per cent teachers.

Whoever employs the graduate should understand that the latter has things yet to learn and that he should be given opportunity to develop. The graduate should also know that there are still things to learn. He does not always seem to know that, but his fault in this respect is much exaggerated by those who see him afar off rather than close at hand. The employer should know what to expect of the graduate and how to get the best use of him with regard to the future as well as the present. My father, as apprentice to a wood carver, was scolded because too often he used his jack-knife where the master carvers had learned to use the appropriate tool. The general manager who if he had his way would have no civil engineers in the employ of the road, still wants to use his jack-knife instead of the tools which some skilled managers have found proper and useful.

Several of my graduates entered the employ of a railway as section men; this at the suggestion of the railway president. Later it was found that there was little chance to get ahead for any of them, and one was told by the president that there really was little outlook for the future on that road. He went to another railway. One may possibly suspect that he was not "practical" and had the "big head." Perhaps so, but on the other road he was advanced and shortly became, so I was told, the highest salaried signal engineer in the United States. He was too practical to stay where he had no chance for the future. He afterwards bettered himself by leaving railroad service.

Are the graduates to be blamed if they do not go into railway work in recent times where so many railways have been operated under receiverships and others have been reducing both new construction and maintenance expenses to a minimum? Civil engineering graduates find satisfactory opportunity outside of railway work. There is a considerable trend just now towards industrial enterprises, and other branches of engineering attract students away even from civil engineering. In the long run supply and demand will probably regulate the matter.

SAVINGS WITHIN THE DESPATCHER'S POWER

By J. L. Coss

The chief despatcher can prevent delays to trains in many situations just as well as to leave the responsibility to rest on the trick despatcher. The conductor of a freight train should know, when he starts out, barring accidents, exactly what he is expected to do throughout the run. If he is called upon to do any work at way stations of which he has not been advised in advance, there will be delays; delays also to other trains. The conductor and the engineman who are alert, usually figure carefully beforehand what they are to do; and the chief despatcher should be as careful to aid them as he is to aid the despatchers in their figuring.

Many occasions arise when a despatcher can aid in fuel economy. Avoid having trains enter side tracks unnecessarily. How frequently one sees a train pull into a side track, and then, after getting further help from the telegraph office, pull out again. This is a waste of fuel, and often is avoidable. Where it is much easier at a meeting point for the superior train to enter the side track, the despatcher should be on the watch and give the inferior train the right to the main track. Oftentimes a local freight can effect a considerable saving by doing its work on the main track; this should be provided for where possible. To pull into a siding and wait

for a train to pass, then pull out, with perhaps a number of merchandise cars, to do switching, then go back after the balance of the train, uses up quite a bit of coal.

It will not hurt a through freight to pull through the side track to favor the local, sometimes. When a long freight train takes the siding to meet a light engine, the disregard of economy is obvious to everyone.

Remember that the engine of a work train burns coal, and its time should be economized. On branch lines, work trains should continue at work and protect against first class trains until driven in. A switching engine, standing in a yard and waiting for a late passenger train, 30 or 40 minutes, is burning up the company's money.

The writer, on one occasion, had to annul a second class train, No. 55. Opposing train No. 56, of the same class, was superior by direction. The order was sent to B for No. 56. Operator B said that he did not need it; but he took it; and then the conductor said the same. He, also, finally took it, however. These objectors to what they thought was an unnecessary burden on their minds forgot that the superior train might waste an appreciable amount of time in slackening speed, according to the rule, at all sidings, until the expected train should be met—which train would never come.

POSTMASTER GENERAL ASKS REDUCTION IN MAIL PAY RATES

In accordance with the new law governing railway mail pay passed by Congress last summer, providing for a test of the space basis of compensating the railways and placing in the hands of the Interstate Commerce Commission the final determination of the method and rates of payment, the postmaster general has filed with the commission a comprehensive statement, showing the transportation required of all railway common carriers, including the number, equipment, size and construction of the cars necessary for the transaction of the business; the character and speed of the trains which are to carry the various kinds of mail; the service, both terminal and en route, which the carriers are to render; and what he believes to be the reasonable rate of compensation the railway carriers should receive for the transportation of the mail. The statement comprises a book of 734 large printed pages, most of which is devoted to statistical information, and many drawings, and includes a statement by the postmaster general asking the commission to adhere to the space basis of payment with respect to the service which was put on the space basis by order of the postmaster general on November 1 and that the weight basis should be adhered to with respect to the small percentage of the service left on the weight basis. He also reports that under the tentative maximum rates applicable to the space basis, the total compensation to the railways is $3,222,405 greater per annum than the total compensation on the weight basis which was superseded. He represents that this total is excessively large, and that the rates provided by the act for the respective units of space and service should in general be reduced by the commission.

For the purpose of furnishing the commission data with respect to the weights of mails carried, the space in cars and information regarding the amount of service performed and facilities furnished and other data necessary for the determination of the questions to be decided by the commission, the postmaster general says there should be selected a period of five weeks during which a general weighing of all the mails on railroad routes throughout the United States shall be provided for by the postmaster general, the collection and certification of this data to be made by the postoffice department and the railroad carriers, respectively, for the matters especially within their charge. He suggests a period beginning March 27. The statement also includes an argument as to the reasons for a reduction of the mail pay rates, in which it is contended that because of the nature of the service and the relations between the railways and the government, rates for mail transportation should be lower than rates for the ordinary transportation business of the railroads.

The commission has ordered a copy of this statement to be served upon each of the carriers, who are given until May 1 to file written answers setting forth their objections, if any.

Appendix A, which comprises the bulk of the statement, sets forth in tabular form the mail service performed by each road, showing the routes and their length, class of service authorized, the number of trips per annum, miles of service per annum, rate per mile, land grant rate, if any, annual rate, initial and terminal allowance, and combined annual rate and initial and terminal allowance, for both the service stated on the space basis and that continued on the weight basis. The principal laws and regulations, rules and instructions governing the transportation of the mail are set forth in Appendix B and Appendix C gives the specifications for mail cars.

The statement describes the service as of November 1, 1916. It is stated, however, that such requirements must necessarily change with the changing conditions and necessities of the service and that changes in authorizations of car units and initial and terminal allowances are made from time to time as the service conditions change, corresponding change being made in payment.

In the event that the commission deems it desirable to make an estimate of the cost of carrying the mails and express, respectively, the statement says that there should be secured and certified to the commission the operating expenses and other charges against income of railroad mail carriers with such allocation of direct expenses and apportionment of the remaining indirect expenses as will enable it to ascertain the estimated cost of passenger train operation; also a segregation of the direct operating expenses incurred in the carriage of the mails and express, respectively, together with other details of the service, including a specification of the space used for mail, express and passenger service, respectively, in order to enable an allocation of the direct expenses and to furnish a ratio of car-foot miles as a basis, with proper modifications, if the same can be used, for a fair and equitable apportionment of such remaining estimated cost of passenger train operation to the transportation of the mails and of the express in such trains. There should also be, the statement says, a certification of such data as will enable the ascertainment of the average tons per mile, the average carload of express traffic and the revenue derived therefrom by the express companies and the railroads and of the average passenger car-mile revenue, express car-mile revenue and mail car-mile revenue to the companies.

The rates for the respective units of space and service, the postmaster general represents, should not exceed the following:

For full railway postoffice car mail service 20 cents for each mile of service by a 60-foot car, and in addition thereto $4 as a combined initial and terminal rate for each one-way trip of a 60-foot car.

For apartment railway postoffice car mail service 10 cents for each mile of service by a 30-foot apartment car, and 5 cents for each mile of service by a 15-foot apartment car, and in addition thereto $2 as a combined initial and terminal rate for each one-way trip of a 30-foot apartment car and $1 as a combined initial and terminal rate for each one-way trip of a 15-foot apartment car.

For storage-car mail service 18 cents for each mile of service by a 60-foot car, and in addition thereto $4 as a combined initial and terminal rate for each one-way trip of a 60-foot car; and for storage space in units of 3 feet, 7 feet, 15 feet and 30 feet, both sides of car, in baggage cars at pro rata of same.

For closed-pouch service 1½ cents for each mile of service when a 3-foot unit is authorized and 3 cents for each mile of service when a 7-foot unit is authorized, and in addition thereto 25 cents as a combined initial and terminal rate for each one-way trip of a 3-foot unit of service, and 50 cents as a combined initial and terminal rate for each one-way trip of a 7-foot unit of service.

For service continued on the weight basis of pay the rates allowed should

not exceed the rates provided by the act of 1873 and the amending acts, adjusted on the basis of annual weighings.

These rates are tentative and subject to modification upon a full consideration of the facts to be hereafter presented.

The present maximum rates as authorized by the law are 21 cents for a 60-foot car and $4.25 for the combined initial and terminal rate, 11 cents for 30-foot apartment cars, 6 cents for 15-foot apartment cars, and $2.75 for the combined initial and terminal rate for 30-foot apartment cars and $2.00 for 15-foot cars; 21 cents for 60-foot storage cars and $4.25 for the combined initial and terminal rate. For closed-pouch service the rates recommended are the same as those now in effect.

The postmaster general further represents that the maximum rates are intended as compensation for the entire service performed, including transportation and incidental service required in connection therewith, and that the rates suggested are also so intended, but that it may be desirable in the administration of the service to except from the requirements the carriage of the mails between railroad stations and postoffices and it is suggested that any rates fixed by the commission should be alternative, including all the service required and excepting the incidental services. The statement says that the maximum rates fixed by the act of July 28, 1916, are those recommended by the joint committee of Congress and that this recommendation was made upon a consideration of the average passenger car-mile revenue without crediting the mails with as much reduction in rate for the differences between mail transportation and the transportation of other commodities and passengers as the postmaster general believes they warrant; that he had recommended lower rates to Congress and believes Congress did not intend these rates to be final.

With reference to the reasons for a reduction in the rates, the statement says in part:

"The postmaster general further represents that the act of July 28, 1916, above referred to, requires this honorable commission to consider the relation existing between the railroads as public-service corporations and the government and the nature of such service as distinguished, if there be a distinction, from the ordinary transportation business of the railroads; and that in accordance therewith among the elements to which the commission should give consideration and which justify lower rates for the carriage of the mails than otherwise would be reasonable, are the following:

"(1) The certainty, constancy, and homogeneity of traffic.

"(2) The certainty and regularity of payment.

"(3) The mails follow the railroad construction and operation. Railroads are projected and built not primarily for the carriage of the mails but for the purpose of securing passenger and freight traffic. Their business is that of common carriers. After the railroad is constructed, the mails naturally follow and the companies usually secure that business without solicitation. It is a traffic which offers itself to the companies without solicitation and remains without urging or other consideration except good service.

"(4) The protection of mail trains. The carriers receive from the federal government protection to their mail trains against unlawful acts in interference with or obstruction of the mails which they carry.

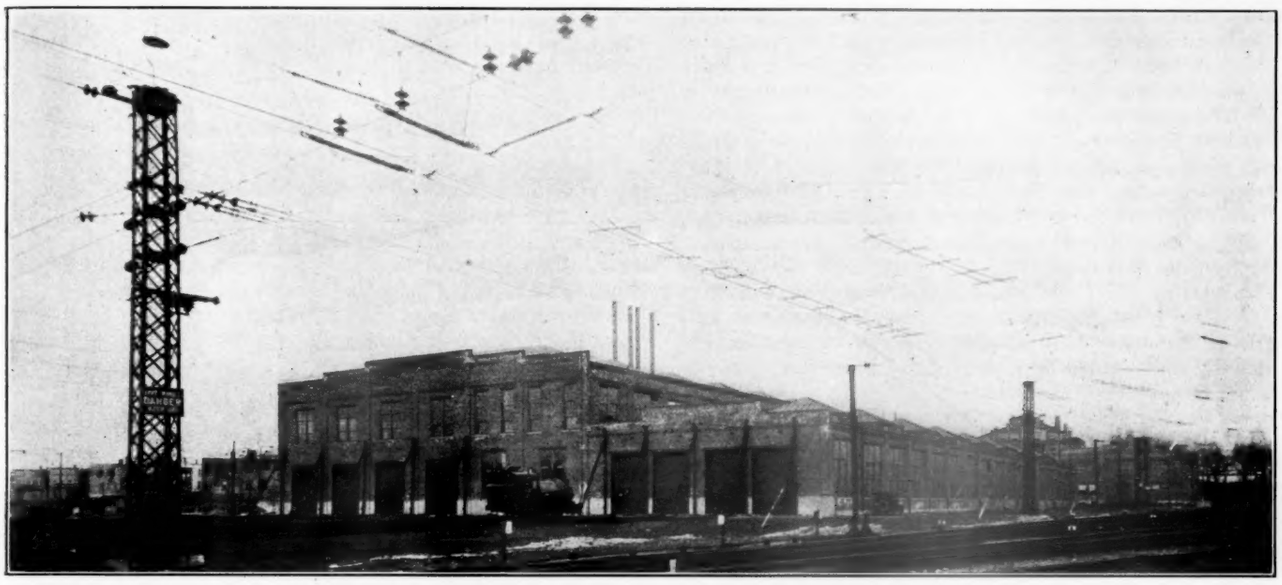
"(5) The relation existing between the railroads as public service corporations and the government, and the principle of public utility. The carriage of the mails by the railroad companies for the government cannot be considered as of the same character of service as that performed by them as common carriers for the general public. The railroads have received certain benefits from the state from which they derive their corporate existence, and their interstate commerce is subject to the regulation of the federal government. Some of them have received substantial aid from the federal government by grants of land and otherwise. They are declared by law to be post roads. As mail carriers they are agencies of the postoffice department, and are performing a governmental function in carrying the mails. The postal business is not carried on by the government for profit but in furtherance of the constitutional power to establish postoffices and post roads under which it furnishes postal facilities to all of its citizens. The railroads, therefore, may not deal with the government as they would with a shipper who uses their facilities as a common carrier for profit or for some special individual advantage. They are not only required to act as governmental agencies but should fulfill the obligations of that agency for a consideration not necessarily measured by the strict rules governing commercial business. Furthermore, the principle of public utility, which justifies the railroad carrier in transporting certain commodities at rates lower than rates formed on strict apportionment of cost because their transportation renders possible the development of their property and the industries located along their lines of road, thus contributing largely to the transportation business for which the railroads are primarily constructed, applies with special force to the transportation of the mails which is highly essential to the up-building of communities and the increase of the carriers' business, and, therefore, should be classed among those services which minister to the development of the processes of production rather than to the satisfaction of wants through the transportation of the products, and justifies a low rate.

"In further compliance with the requirement of the act hereinbefore mentioned that he shall embody therein what he believes to be the reasonable rate or compensation, the postmaster general will, with the permission of the commission, submit hereafter his views with reference to the application of the principles which should govern the determination of rates under the facts which shall be developed in the investigation, and, in the meantime, represents:

"(a) That, considered with reference to cost, the estimated cost of the service based upon direct expenses and an apportionment of indirect expenses prorated upon a basis of space occupied in the trains or a modification thereof to meet the specific facts, may be appropriate for comparison, but such estimated cost cannot be taken as the sole factor upon which to base the rates of pay, and rates fixed materially lower than such theoretical ascertainment could not be condemned as noncompensatory and burdensome to other traffic or as unreasonably low.

"(b) That, considered in connection with revenue received by the railroads for their services, and subject to the qualifications of the principles and restrictions applicable to such comparisons, the fair and reasonable rates for the service in question (1) should be lower than rates for the ordinary transportation business of the railroads, such difference being measured by an appraised value of the abovenamed, and other elements which distinguish the nature of the carriage of the mails from other transportation business; (2) should be lower than the average passenger car-mile revenue to the railroad carriers, such difference being measured by the appraised value of the elements distinguishing the nature of the carriage of the mails from the carriage of passengers; and (3) should be as low as or lower than the compensation received by the railroads from express companies for the transportation of express matter and the services performed by the railroads in connection therewith, modified by the appraised value of differences existing between the two classes of service, if any."

MACHINE TOOL EXPORTS.—The machine tool exports from America during the year ending June 30, 1916, are said to have exceeded $61,000,000, of which about $48,000,000 left through the port of New York. This is more than twice the amount of similar exports for the previous year.



General view of New York, New Haven & Hartford Shops at Van Nest, N. Y.

New Haven Shops for Electrical Equipment

Facilities for Making General Repairs to Electric Locomotives and Motor Cars at Van Nest, New York

WITH its constantly increasing electrical equipment, the New York, New Haven & Hartford has found it necessary to provide adequate facilities for repairing it. That company now operates over 100 electric locomotives, 27 motor cars and 76 trailers. The electrical work required is of such a nature that special facilities must

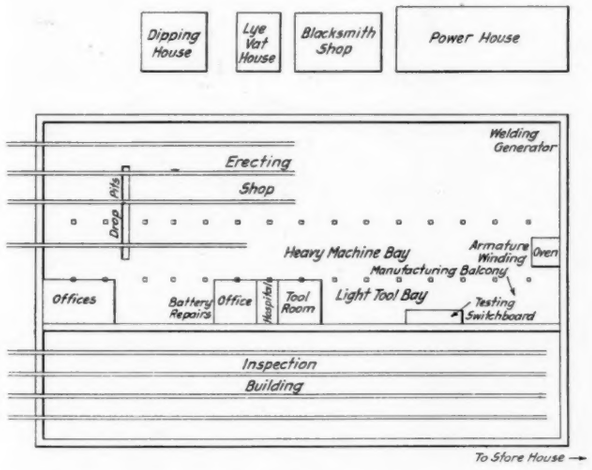


Fig. 1—Arrangement of Buildings at the Van Nest Shops of the New Haven

be provided to handle it economically. The new shops are located at Van Nest, New York, on the outskirts of New York City. Since 1907 the only facilities for making repairs to the electrical equipment were in a shed at Stamford, Conn., which contained two drop-pits, a jib crane and a few machine tools. The new shops are the largest and best equipped plant ever built for the maintenance of heavy traction electrical equipment.

The work done at these shops is principally the overhauling of the electric locomotives and motor cars at such time as their general condition requires. In addition, motors and wheels on freight and switching locomotives are changed, and heavy repairs are made in case of damage due to accidents. Passenger locomotive motors and wheels, however, are usually changed at Stamford, when such work is necessary between overhaul periods. Both Stamford and Oak Point, New York City, have facilities for inspection and light repairs to electrical equipment, and none of this work is done at Van Nest.

The machine shop facilities at Van Nest are taken advantage of in the manufacture of various small parts used

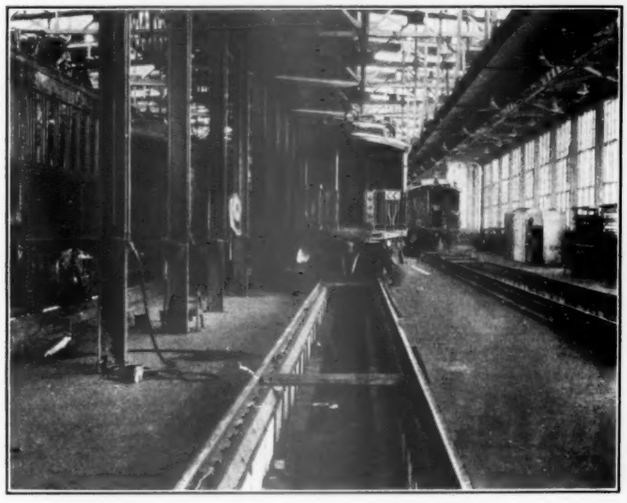


Fig. 2—Inspection Building

in the ordinary maintenance and repair work on electrical equipment.

Arrangement of Buildings

As shown in the diagram (Fig. 1) there are two principal buildings, forming together one structure. The in-

spection building (Fig. 2) contains four pit tracks; it is used for such work as can be done from the pits, and serves also for storage room. A useful feature of the pits is a shelf walk on each side, on which a man stands when working, while others can pass beneath him along the bottom of the pit without interference; they also make it easy to get into or out of the pit at any point. The pits are well drained, and are kept clean and free from obstacles. An overhead platform between tracks facilitates work on pantagraphs, enabling a man to cross from one locomotive or car roof to another on the next track.

The erecting shop and the adjacent heavy machine bay are each provided with overhead cranes running the full length of the main shop building. These sections are exceptionally well lighted by skylights and large side windows both below and above the crane tracks. The light tool bay occupies the southeast corner of the ground floor, under the balcony, and is lighted by side windows. The foreman's office and a well equipped emergency hospital occupy an enclosure beneath the center of the balcony. West of this enclosure is a space where work is done on the storage batteries used for control and lighting on locomotives, motor cars and trailers. A small motor-generator supplies direct current for charging the batteries.

The armature winding department is located at the east end of the heavy machine tool bay, where it is conveniently reached by the overhead crane and is adjacent to the oven used for baking coils.

The manufacturing balcony extends the entire length of the south side of the shop above the small machine tool bay, foreman's office and battery floor. Miscellaneous parts required for maintenance are made here, including switch group contactors, blowout coils, pantographs, third rail shoe mechanisms, brush-holders, etc. Bearings are re-babbitted; and relays, switch groups and other apparatus are assembled here. Besides the machine shop, this department has a carpenter shop and a small brass foundry. The parts manufactured here are sent to the storeroom and charged to the stores department.

Heat, Light and Power

An outstanding feature of these shops is the excellent natural lighting, obtained by skylights throughout the length of the main building and by two rows of large windows above and below the crane track, occupying practically all available wall space. The photograph of the erecting shop (Fig. 3) is a good illustration of the results obtained.

Artificial lighting for general illumination is provided by large unit incandescent lamps and reflectors suspended near the ceiling. Extension line receptacles are liberally provided. On the larger machine tools, the wiring for adjustable lamps is placed in flexible metal conduit coming up through the floor, which overcomes the objections to drop lights and extension cords.



Fig. 3—General View of Erecting Shop at Van Nest

The forced air heating system maintains a comfortable temperature in the shops during the coldest weather and provides effective ventilation. The heating is uniform, and is distinctly more comfortable than most other shops of such large size.

The local power plant contains steam-driven air compressors, and supplies steam for heating the shops and operating the blowers for the heating and ventilating system. The switching equipment for the shop electrical power is located in the power plant.

All electrical power used in the shops is three-phase, 25-cycle, distributed at 550 volts. The power comes from the three-phase bus at Cos Cob, Conn., about 20 miles from the shops, from which single-phase power is taken for propulsion, and although it is slightly unbalanced, the effect is not noticeable on the motors. All machine tools are direct

driven by individual three-phase induction motors and no line shafts or belts are used. This type of installation contributes to the effectiveness of the shop lighting by the absence of belts and line shafts.

The 11,000-volt contact wires in the yard are not carried into the building, but are dead-ended outside, and the equipment is moved into and out of the building by a small steam switching locomotive.

System of Overhauling Equipment

When a locomotive comes in for general overhauling it is at once placed in the erecting shop and taken apart completely. As all parts are interchangeable between locomotives of the same type, it is re-assembled with such parts as are available, and not necessarily with the equipment it contained originally.

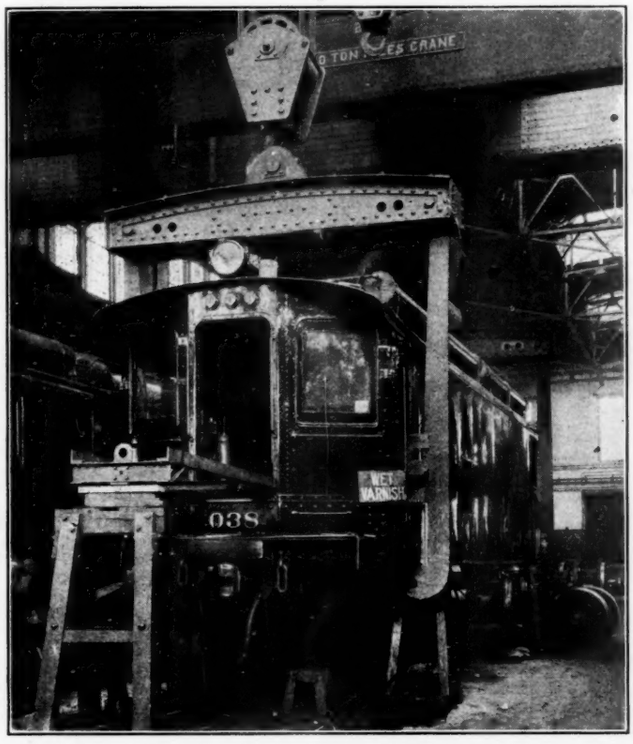


Fig. 4—Lifting a Locomotive Cab

Axles and motors are dropped out, the cab lifted from the trucks, and transformer, switch groups, air compressors, etc., are removed for repair or renewals. The traction motors are dismantled and the fields and armatures are dipped in varnish at 190 deg. F.; then baked for 72 to 100 hours. The practice of dipping the windings at each overhaul period has been found effective in reducing insulation failures. The commutators are also turned and undercut at this time.

A great many effective machines and methods have been developed at Van Nest to meet the unusual problems encountered in handling electric rolling stock. One of the most interesting is the quick method of dismantling and assembling box frame motors. A cab or a motor-car body is handled with two pairs of hooks and two overhead cranes (Fig. 4). Adapters are used on the hooks to fit the various shapes of underframes. A 300-ton vertical hydraulic press is used for pushing out armature shafts, quills, commutators, compressing laminations, etc.

Shop Equipment

Two 60-ton Niles cranes serve the erecting bay and there is one 30-ton crane in the heavy machine aisle. These cranes are all equipped with both main and auxiliary hoists. There are three drop pit tracks in the erecting shop, served by a transfer pit with a narrow gage track and suitable trucks. A hydraulic plunger is located under each track, and equipment is provided so that work may be done in all three pits at the same time. Dropping out axles is accomplished as in steam railroad shops, but special equipment is required to handle the geared motors, which are removed from below after the drivers are dropped out. With this equipment, a passenger locomotive motor and driving axle can be changed in an hour and forty-five minutes; a freight locomotive with geared motors requires a slightly longer time. In Fig. 5 a passenger locomotive axle with its motor is being removed.

Large machine tools include a 96-in. Pond wheel lathe, a 96-in. boring mill, a 60-in. engine lathe, 42-in. wheel lathe, two planers, several other large lathes, a milling machine, boring tools, etc., and a Newton cold saw. Besides the 300-ton armature press before described, there is a 600-ton horizontal wheel press. In the blacksmith shop are a large steam hammer, a forging machine and a double punch and shear for heavy sheet metal.

Two small storage battery motor trucks are used for transportation between the shops, storehouse, lye vat house, blacksmith shop and scrap yard. The varnish tank for dipping armatures and fields is located outside the main shops, to avoid risk of fire. There are two tanks, connected by an underground pipe with provision for drainage from one tank to the other in case of fire.

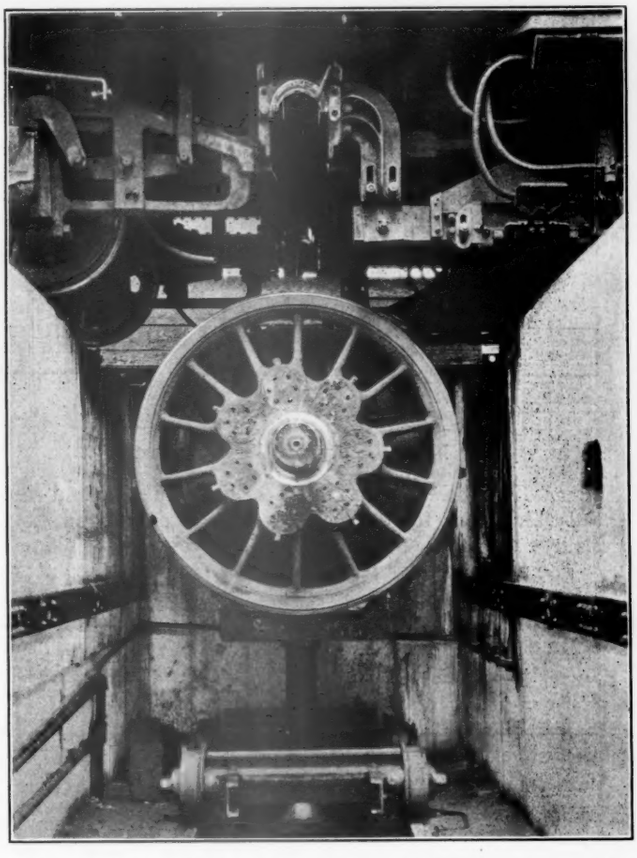


Fig. 5—Dropping Axle and Motor from Passenger Locomotive

Most of the welding and cutting in the shops is done by the oxy-acetylene process. The shop and inspection shed are provided with a piping system, having taps at convenient points, for oxygen and acetylene, for which the feed tanks are located in a separate building. The shop is also wired with special lines for electric welding. Power is supplied from a 400-ampere Ridgway welding generator operating at about 90 volts, driven by an induction motor. Three welding circuits may be operated at once and there is a separate

bank of resistors for each circuit, behind the main switchboard.

Testing Equipment

The apparatus for testing air brake equipment, located on the manufacturing balcony, is one of the features of the Van Nest shop equipment. There are three separate outfits. A large rack contains train line pipes, hose couplings and equipment equal to that of a six-car train. This may be divided into three separate parts, each part with its engineer's valve as used on a motor car, freight locomotive or passenger locomotive, connected to distributing valves from the same equipment. A standard yard testing outfit is connected to the rack to represent the train line conditions for a 100-car train. This rack is used for special tests, and with it any conditions of air brake operation encountered on the road may be duplicated in making a test. There is also a standard M. C. B. rack for testing distributing valves.

Another large rack is used for testing pneumatic signal valves, and contains apparatus corresponding to a 10-car passenger train. For testing and adjusting feed valves and reducing valves, special equipment is provided to determine the accuracy of adjustment and sensitiveness of these valves. Compressor governors are adjusted when mounted at the most unfavorable angle for operation, making doubly sure that they will operate when placed upright in the locomotives. On the M. C. B. rack there is an adjustable differential valve used for determining friction of and testing for leakage around pistons in distributing valves or triples.

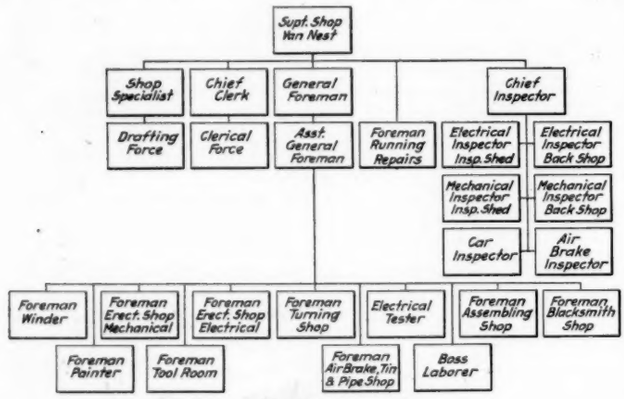


Fig. 6—Organization Diagram

The air brake department tests and repairs equipment sent in from any point on the electrified zone, in addition to that taken from locomotives or cars being overhauled in the shop. A transformer, motor generator and switchboard, on the ground floor, are provided to obtain any voltage, a.c. or d.c., required for testing control equipment, air compressors, etc.

Shop Organization

The chart in Fig. 6 gives a general idea of the organization and duties of the various positions. The chief inspector and his assistants attend to the inspection of all work done in the shops, including the complete locomotives or motor cars, any equipment removed for repairs, and all parts made in the manufacturing department.

The material production clerk looks after ordering all material, checks the receipt of material and keeps record of all shop orders. The shop specialist or tool expert has general charge of design and changes of all shop tools, templets, jigs, dies, etc. Interchangeability and efficiency of tools are promoted by having one man in charge of this work. He also suggests improvements and short cuts in shop operations.

The general foreman, besides having general charge of the shop, has particular charge of the work on electrical equipment. The foreman of electrical construction looks after all wiring on locomotives and cars, and pays particular attention to overhaul work, while the assistant electrical foreman superintends running repairs made in the inspection shed.

The foreman of the winding department has charge of all work on armatures and fields. The assistant general foreman reports to the general foreman and has charge of mechanical department work. The electric welding and gas welding work is done under the direction of the pipe fitter leader, who also looks after the maintenance of the gas and electric welding system.

A double check on time keeping in the shops is effected by the use of a time clock in connection with a time card system. The detailed records for calculating costs are taken from the time cards, but the payroll is made up from the clock record.

Apprentices

Two-year and four-year courses are given to men training in the shops. The special apprentice or two-year course is designed for technical graduates, and includes general training in both mechanical and electrical work. These men may also be called on for work at other points or on the road. The regular four-year apprenticeship course at Van Nest includes two general classes, mechanical and electrical; the mechanical is subdivided into blacksmith, sheet metal and took maker courses, in which the apprentices put in the full time on specialized work, and the general mechanical course, in which is included three months' electrical work, machine shop, assembly, erection, etc., in the different parts of the shop. The electrical apprentice is given experience in all electrical work done in the shop, including armature winding, and in addition spends three months at mechanical work, principally in the machine shop.

WASHINGTON CORRESPONDENCE

Washington, D. C., March 13, 1917.

Newlands Committee to Resume Hearings

The Newlands Joint Committee on Interstate Commerce, which suspended in December the hearings in its general inquiry into questions pertaining to government regulation and government ownership of railways, is now expected to resume its hearings in Washington on Monday, March 19. It is probable that Alfred P. Thom, counsel for the Railway Executives' Advisory Committee, will be the first witness, as his cross-examination at the December hearings had not been completed by members of the committee. He will probably be followed by a number of railway executives, although the committee has not yet announced a program. The committee held two meetings last week in the effort to decide on a date and a plan of procedure and adjourned on Friday until Saturday of this week just before the President issued his call for an extra session of Congress. There was some talk of postponing the hearings until after the extra session, but Chairman Newlands was anxious to get something done before that time and succeeded in arranging to get the committee together for the month before Congress reconvenes. A program for the hearings is expected to be outlined at the meeting of the committee on Saturday.

Labor Troubles of the A. F. of L.

Capitalistic corporations such as railroads are not unique in being subject to occasional labor troubles, it appears from a recent experience of the American Federation of Labor. The officers of the federation have had occasion to take part in many strikes in which they have been arrayed against the employers, but they have recently had the somewhat novel experience of being called on to avert a strike against themselves. The American Federation of Labor has offices in Washington in which it employs a good many clerks and stenographers, who recently came to the strange conclusion that if the $3 a day minimum wage doctrine advocated by the federation was such a good thing for the employees of

corporations, it might be a good thing for them. It seems that the federation has some employees to whom it has not considered it feasible or desirable to pay that much. The stenographers and clerks naturally had little difficulty in learning of a commonly practiced method for remedying such a condition and they presented demands for the $3. The demand was taken under advisement but when results were not promptly forthcoming the employees followed another common practice and held meetings at which they threatened to strike. Possibly because the federation officials knew that strike threats are often bluffs that also proved unsuccessful, and the employees proposed arbitration, the federation officers found it much simpler to make a "temporary reduction" in force which by a strange coincidence affected some of the more active participants in this particular labor movement and neither the proposed arbitration nor the threatened strike have been sufficiently active since to attract newspaper notice. The federation naturally has not been seeking any publicity for the affair and the agitators are probably busy holding down or seeking new jobs, but whether any of them have succeeded in connecting with one of the government clerical positions for which Congress has legislated an increase of pay largely at the instance of the American Federation of Labor does not appear.

The Freight Car Situation

The Commission on Car Service of the American Railway Association continues to receive almost daily delegations of shippers from various parts of the country, asking for special relief from provisions of the car service rules or special efforts to furnish them cars for loading. While there have been many complaints about the operation of the new car service rules which went into effect on February 1, the number has diminished as the rules have become better understood and various questions pertaining to the change of rules have been worked out. The Interstate Commerce Commission's order postponing the effective date of its partial set of rules expires on Thursday of this week and the railroad committee has asked the commission to postpone it still further.

In response to many communications received from shippers regarding the new car service rules, the Commission on Car Service has written letters stating that the new rules are not intended to destroy the mutual interest that must exist between the shippers and the railroads, but that naturally there will be more or less confusion or misunderstanding until every person becomes familiar with the changed methods and their success depends on a hearty co-operation between the shipping public and the railroads. While many shippers have expressed their approval, the commission said, it was somewhat apprehensive that some few, both railroads and shippers, have been prone to use the new rules as a subterfuge to cover up some of their shortcomings for which they are alone responsible. Shippers were asked to co-operate in giving the new rules a fair trial taking up with the local representatives any questions that may arise from time to time.

A marked reduction in the number of freight cars held in accumulations at various places is shown in reports for March 3 received by the Commission on Car Service. On that date the railroads were holding 123,063 cars which could not be moved for various reasons, embargoes, inability of consignees to accept, lack of vessel capacity, congestions, weather conditions, etc. On February 24, 138,679 cars were being held; on February 17, 171,207, on February 10, 170,016, and on February 3, 145,667. The Commission on Car Service recently asked all roads to have a "clean-up" week during which they should make a special effort to check up all cars in their accumulations and to get rid of cars which have been the subject of complaints and communications for some time and it is thought that, barring a period of severe weather, these efforts should result in decided improvement.

The Commission on Car Service has issued a circular to all railroads recommending that to avoid confusion on the part of the railroads as well as the shipping public and in the interest of uniformity in issuing general embargoes, exceptions or modifications be made as local conditions may warrant or permit, as to live stock, perishable freight, shipments consigned to the United States government or its officers, food supplies and feed for livestock, tin cans for condensed milk when so way-billed, printing paper, fuel coal, and material and supplies consigned to railroads. It was also suggested that certain material moving at seasonal periods be exempted except when an accumulation exists, such as agricultural implements, fertilizer, seeds, etc., and that exemptions should be made of shipments of coal and coke consigned to hospitals, schools, gas companies and other public utilities, also petroleum and its products in tank cars. It was also recommended that export traffic be handled on a permit basis uniformly in order that accumulation at ports may be controlled.

The special arrangements by which cars were furnished by the Eastern roads for running solid trainloads of flour and grain from Minneapolis has been discontinued and representatives of other cities that asked for similar arrangements have been informed that this arrangement was made temporarily to meet a particular emergency. A number of representatives of railroads have appeared before the commission to ask a modification of the per diem rules. F. H. Alfred, general manager of the Pere Marquette, told the committee that the average length of time that coal cars are on its road is approximately 14 days and that the average daily earnings per car are $2.05. Based on the average percentage of expenses to earnings, 69 per cent, this gives net earnings of only 63 cents per mile, leaving a deficit of 12 cents as compared with the per diem rate of 75 cents. Representatives of the Chicago Board of Trade who appeared before the commission on March 9 to ask for cars for grain shipments, presented figures showing that in January and February, 1915, 638 cars per day were loaded out of Chicago, while in the same two months in 1916 the number had fallen to 470 and in 1917 to 242. They were shown that the average loading for the first six days of March was 325. A committee representing the Chicago board was before the Car Service Commission again on Monday and Tuesday.

The commission has informally discussed with representatives of the Interstate Commerce Commission the question of how to deal with the roads that have refused to put into effect the new car service rules and penalty agreement.

W. A. Worthington, vice-president of the Southern Pacific Company, has resigned from the Commission on Car Service in order to devote his time to pressing duties on his own road.

Members of the Committee on Relations between Railroads held a conference on March 8 with the demurrage committee of the National Industrial Traffic League to discuss the matter of demurrage rates to be applied after May 1 when the rules now temporarily in effect expire. The league committee pointed out certain objections to the present rules and the American Railway Association committee suggested a plan for a demurrage rate of $2.00 per day for the first four days after the expiration of free time and a rate of $4.00 thereafter. Another meeting to discuss the matter will be held on March 20.

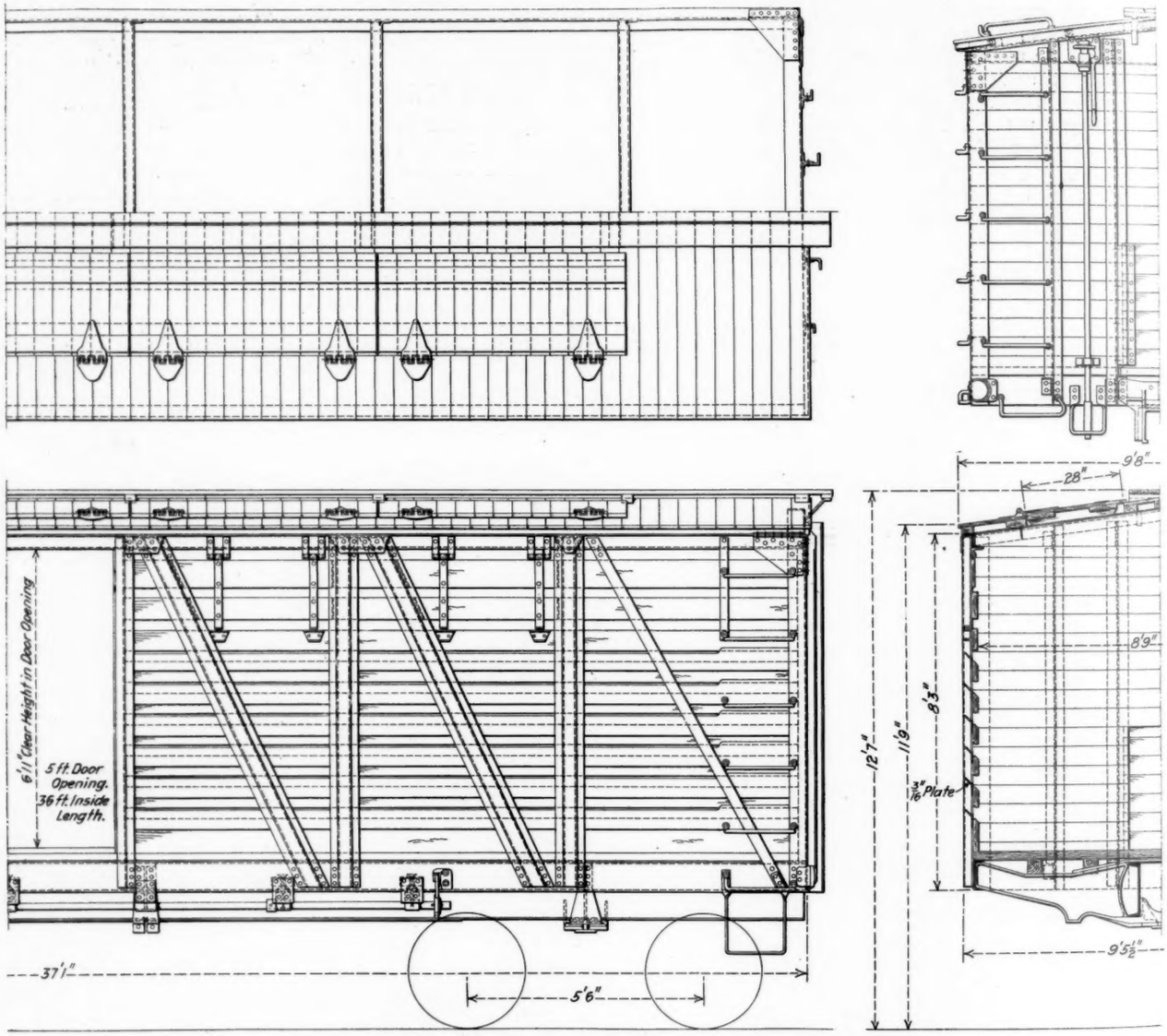
The suspension board of the Interstate Commerce Committee held a hearing at Washington last week at the request of shippers who wished to protest against new tariffs covering charges for reconsignment and diversion of cars which have been filed to become effective on March 15. The shippers generally contended that the reconsignment privilege is a necessary one in the conduct of their business which should not be penalized, while the representatives of the railroads replied that the shippers had admitted that the privilege is a valuable one and, therefore, it should be paid for when it operates to cause detention of cars.

BETTS COMBINATION STOCK AND COAL CAR

As the cost of transportation increases from year to year railroads are finding it necessary to take advantage of every possibility for saving money and great efforts are now being put forth to see that there is no unnecessary hauling of empty cars.

The men in the operating department are constantly reminded that it is to the advantage of the railroad never to haul a car empty that can, by the use of ordinary ingenuity, be loaded. Nevertheless, the increase in the number of cars built especially for hauling certain commodities has kept the ratio of loaded to empty car mileage from increasing.

In many midwest states the shipment of livestock makes up a considerable portion of the eastbound freight traffic, and coal is a large percentage of the westbound tonnage. Special cars are provided for each commodity, the coal being hauled in gondolas and the stock in the regulation slatted car. In both cases the cars are hauled empty for long distances. Many of the stock yard centers are near coal mines, as for instance, Chicago is not far from the Illinois fields, and St. Louis and Omaha are similarly situated. It will be appreciated that a stock car which is adapted to hauling coal would eliminate a large amount of empty car mileage. If sent to any of these packing house points it could be shipped on to the coal mines and returned loaded to the stock-raising section. If sent to the Atlantic seaboard it would be available for carrying anthracite coal west. The saving effected by a reduction of the empty mileage would be a considerable item. Not only would there be a direct saving in the transportation charges, but a smaller number of cars would be required, and interest, depreciation and maintenance would also be reduced. Realizing the field for a car which would reduce the empty car mileage, E. E. Betts, superintendent of transportation of the Chicago & North Western, has designed a special stock car which may be used for hauling a large number of commodities.



Arrangement of the Betts Combination Stock and Coal Car

The extensive field for a combination stock and coal car may be realized by considering the amount of stock moved into Chicago from the states of Iowa, Nebraska, Minnesota, North and South Dakota and Wisconsin. During December, 18,129 cars of stock were brought into Chicago from these states. Assuming that the origin of the traffic was in the center of each state, and basing the average mileage on

this, we have the following figures for the stock car movement during the month referred to:

States	Estimated Average Miles	Cars	Total Estimated Loaded Car Miles
Iowa	369	12,506	4,614,714
Nebraska	500	117	58,500
Minnesota	430	1,793	770,990
North Dakota	790	29	8,690
South Dakota	654	347	226,938
Wisconsin	167	3,337	557,279
Total	...	18,129	6,237,111

Studies of the conditions have shown that the coal traffic in this section balances the stock traffic moving in the opposite direction; assuming that the stock cars and coal cars all return to the source of traffic empty at the present time, we find that if the mines were located at Chicago it would be possible to save 12,474,222 empty car miles by the use of a combined stock and coal car. As there would probably be an empty haul of about 100 miles, even with a car adapted to loading both stock and coal, there would be a possible saving of 8,848,322 empty car miles for the month. The transportation expense of hauling empty cars is generally conceded to be at least three cents per car mile, and on that basis the decrease in mileage given above represents a saving of $265,450 per month, or $3,185,400 a year. Heavier average train loads with a smaller number of cars and a decrease in the total tonnage will result in a saving in all departments. It will lower the transportation expenses and the cost of the maintenance of track, in addition to the saving in car maintenance already mentioned.

The statistics of the Interstate Commerce Commission show that during 68.4 per cent of the time freight cars are not in actual movement in trains or in process of loading and unloading. During a large part of its idle time the car is waiting for lading, and by making a car available for several classes of freight it will be possible to keep it in service a greater proportion of the time. To determine the time consumed in the movement of stock and gondola cars data was secured covering the movement of 100 cars of each class. It was found that the empty stock cars moved as fast as loaded coal cars, and while the empty coal cars required 10 days to make the return trip the loaded stock cars covered the same distance in four days. This indicates that if a single car could be used for both purposes the number of cars required would be greatly decreased. With a maintenance cost per car of $75 per year, decreasing the number of cars by 2,000 would effect a saving of $150,000 per year for maintenance, to which could be added an equal amount for depreciation.

During the past 25 years many attempts have been made to design a car for stock and coal loading, but the mechanical devices which have been applied to enable the car to be converted have given trouble. In his design Mr. Betts has aimed to provide a car which will stand rough usage and will not be affected by weather conditions. The car will carry either stock or coal without conversion. In construction it is similar to the ordinary stock car, except for the special arrangement of slats, which will be described later, and doors in the roof and the deck.

The doors in the roof open toward the outside of the car so that in loading with coal the car may be run under a tipple and loaded in the usual manner. The drop doors in the deck make the car practically self-clearing. To prevent coal from falling out through the openings between the slats, angle plates inclined upwards, making an angle of about 45 deg. with the side of the car, are bolted to the lower slats. This arrangement effectually prevents the loss of coal and the same time provides the same amount of air space as the usual design. The doors in the sides of the car will facilitate unloading when the car cannot be dumped. As is usual in the standard type of stock car, an end door is provided so that rails and structural steel can be readily handled. There is, of course, nothing in the construction of these cars which will prevent their being used for commodities for which the usual type of stock cars can be used, such as brick, tile, wood, etc.

A further improvement on the type of car described above has been devised by Mr. Betts. It consists in adding a 3-ft. opening beside the 5-ft. door, making a staggered opening through the car eight feet wide. This makes it possible to use the car for automobile loading and the superiority of this design over the flat cars which have been used during the past year can readily be seen. A tarpaulin may be used to cover the cars, or the car may be lined with paper.

Applications for patents to cover the principal features incorporated in this design have been made. The details for a 36-ft. car of 100,000-lb. capacity have been worked out, and it is expected that cars of this type will be constructed soon.

HEARING ON UNIT PRICES

As noted briefly in the issue of last week the Interstate Commerce Commission conducted a hearing before John E. Benton, examiner at Kansas City, Mo., last week upon the protest made by the Texas Midland regarding the unit prices applied to its property by the Division of Valuation. The Division of Valuation was represented by C. A. Prouty, director, and C. F. Newman, valuation attorney for the Western district. Pierce Butler and Leslie Craven, attorneys for the Western District, Presidents' Conference Committee, and L. W. Wells, assistant to the general manager and chief engineer of the Texas Midland, represented the Texas Midland. The Texas Railroad Commission was represented by R. E. Parker and the National Association of Railroad Commissioners by Clyde B. Aitchison and A. E. Helm. The hearing occupied all of last week and Monday of this week, adjourning on Monday night to Terrell, Tex., where testimony is to be taken regarding naked land values.

The issues which were heard covered the application of unit prices to clearing and grubbing, grading, pile trestle bridges, zinc treated ties, rail, ballast and track laying and surfacing. At the commencement of the hearing Director C. A. Prouty of the division of valuation stated that the examiner would make no findings obligatory upon the commission but that he would make his report to the commission which report might be adopted or rejected as the commission saw fit. He further stated that if the examiner did make a report the carrier would have a right to be heard before the examiner.

John S. Worley, district engineer for the division of valuation at Kansas City was the first witness called remaining on the stand four days. Mr. Worley stated that the prices which he had applied to the Texas Midland were to the best of his judgment those which would be proper in the case of reproduction and were the result of consideration given to cost data, completion reports, contracts, etc., which had been received from the various carriers. He stated that it was the duty of an accountant from his office to search the records of the carrier for such information. The data which he used in pricing the property of the Texas Midland covered a period of about 10 years.

The first subject considered was the unit prices allowed for track laying and surfacing. The base price for track laying and surfacing was fixed as $680, composed of $45 for loading track material, $250 for laying track, which included the labor item on the ground at the point of track laying and incidental expenses, $225 for train and engine service, $25 for the transportation of men, and $135 for maintenance during construction. To this he added $100 per mile for the running surface which he said would put the track in condition to run ballast trains over it and $220 for a full surface which would complete the track. These prices were

applied to the entire line of the Texas Midland. Mr. Worley stated the $45 per mile for loading track material was decided upon after considering such data as had been received and after discussing the matter with various employees in the district office and from his personal knowledge of the work. Mr. Worley stated that by maintenance during construction was meant what might be termed section labor maintaining the track during the construction period.

The price allowed for ties, included a base price for the ties plus freight and an unloading charge of one cent per tie. The expense of reloading them onto cars and hauling them to the front was included in track laying and surfacing.

An addition of 5 cents per ton was added to the base price of rails for inspection and 50 cents for unloading. He stated the prices shown in the schedule of reproduction include freight, inspection at the mill and an unloading charge at the material yards of 16 cents. The cost of handling rail in the material yard and loading onto cars for moving to the front for laying was included in track laying and surfacing.

Mr. Worley stated that although the question of material yards was of considerable importance he had not gone into the minute details of figuring clerical forces, the cost of land, etc., for them in the reproduction of this property. He said that in the reproduction of this railroad the material would be handled from the junction points with other carriers and that the average length of haul on materials had been considered accordingly. He stated that no information was available as to the cost of unloading or loading material in material yards and that it was impossible to allocate this expense to each piece of property in such detail as to show the cost for each tie, rail, frog, switch lamp, etc. He stated that all the cost data at hand included a flat price for track laying and surfacing. Director Prouty stated that by agreement with the carriers 50 cents per gross ton for all rail up to and not including 90-lb. should be allowed for handling at material yards; 50 cents a net ton should be allowed in connection with other track material and 3 cents per tie should be allowed for handling charges.

Mr. Worley submitted considerable data taken from contracts showing the cost of hauling material, such as rock, cement, cast iron pipe, etc., and said that this data had been given consideration in arriving at the cost of hauling materials on the Texas Midland. This data was secured for different parts of the United States and Mr. Worley was unable to state whether or not the situations were comparable.

Director Prouty stated that in reproducing a property all material would be considered back in the place from which it was originally obtained. Mr. Worley stated that his price of 90 cents for burnt clay ballast was based on a price of 80 cents for the material, plus 5 cents for handling and 5 cents for hauling. The element of time for burning ballast was not given consideration, as he considered it as being a product which could be purchased in the market. In figuring the price for hauling burnt clay ballast, 10 or 12 miles was figured as the average haul and the ballast was considered as coming from two sources—Enloe and Kaufman. One-half cent per ton mile was figured as the rate. The number of cars, train crews, or the labor were not considered.

Mr. Worley stated the sand ballast was assumed as coming from Rosser and an average length of haul was figured, the material being assumed to be loaded by dipper or shovel. Nothing was allowed for the cost of the land from which the sand was taken. Ten cents was allowed for loading and 5 cents for unloading, plus freight.

Mr. Worley stated that nothing had been allowed in the unit prices for the cost of cinders. He allowed 10 cents for loading and 5 cents for unloading, plus freight, with Terrell as the source of supply. He stated that cinders were considered a by-product and the same as waste and that it was the consensus of opinion of the government engineering board that the above price is all that should be allowed. Mr. Butler brought out the fact that short stretches of track on the Texas Midland had been ballasted with cinders which had been purchased by the carrier. Mr. Worley stated that if cinders had been purchased to ballast 15 or 20 miles of track some allowance might be made for their cost, but as this was not the case the matter was not given consideration.

Mr. Worley stated that the amount allowed in the government reproduction estimate for clearing and grubbing was less than was originally done, but that this matter was handled in accordance with a ruling made by the division of valuation that, where timber was on both sides of the track, clearing and grubbing would be allowed for the entire width of the right of way, but if only on one side allowance would be made for only one-half the width of the right of way. Mr. Worley stated his unit cost figure was arrived at by considering contracts for this class of work which had been received at his office but that it was impossible to tell from the contracts and he did not know the amount or kind of clearing which was done in each case nor whether it was comparable with conditions on the Texas Midland.

Mr. Worley stated that he figured the grading would start from each of the six junction points with other carriers. He stated that it was impossible to tell from the report submitted to the division and served upon the commission just where the different classes of material such as gumbo, hard pan, loose rock and solid rock were found. He submitted considerable data showing the costs of moving different classes of material and the carrier was of the opinion that some of them were not comparable with conditions on its line. Also extra costs arising, after the contractors leave the job were not taken into consideration.

Concrete prices were established after consideration of various contracts for this kind of work. Mr. Worley stated that the variations in the prices used was due to the length of wagon haul, whether forms were used in construction, and whether wet or dry excavation was encountered. He stated that the price allowed for bois d'arc piling, caps and timber in culverts was based upon data which had been received at his office. Recent data upon this subject was very scarce, but he thought prices could be obtained on bois d'arc material in East Texas, although no inquiry had been made. Part of the data submitted covered approximately the same class of material as was found on the Texas Midland, but no data was submitted for piling of the lengths in use on the Texas Midland—58 and 64 ft. Mr. Worley stated that doubtless it would be more difficult to drive bois d'arc piling on account of its not being straight but this matter was not taken into consideration in fixing the unit prices.

Mr. Worley stated that depreciation had been figured in accordance with Division of Valuation circular No. 226. The director stated that it was his personal opinion that appreciation should be taken into account and allowed for but he had been overruled in this matter by his associates.

The hearing on Friday morning opened with E. E. Holbrook, special engineer of the Union Pacific, on the stand, who explained in detail his reproduction program and emphasized the influence of the program assigned upon unit costs. He also testified as to the cost of sand ballast and under cross examination by Mr. Aitchison gave the details of 30 years' experience with that material.

In the afternoon session Mr. Newman, of the division of valuation, and Mr. Aitchison and Mr. Helm, for the state endeavored to establish by cross examination of L. W. Wells, assistant to the general manager and chief engineer of the Texas Midland, that he and the Texas Midland were satisfied with the prices allowed by the division of valuation until the Presidents' Conference Committee became interested in the matter, asking a large number of questions regarding the relationship of the Texas Midland to the Presidents' Conference Committee. Later in the afternoon F. Merritt, chief engineer of the Gulf, Colorado & Santa Fe

was placed on the stand to testify with reference to unit prices and the construction program. On Saturday Mr. Wells, Mr. Merritt, C. D. Purdon, chief engineer of the Cotton Belt, and Mr. Leonberger, a former contractor engaged in the construction of the Texas Midland, testified regarding unit prices for this work.

NEW YORK CONNECTING RAILROAD FINISHED

The Hell Gate bridge of the New York Connecting Railroad is now substantially completed, and on March 9 it was dedicated by a brief speech by Samuel Rea, president of the Pennsylvania Railroad. A party of officers of that road and of the New Haven and the Long Island roads, went over the bridge and Connecting Railroad in a special train, and stopped on the bridge long enough for the brief and informal ceremony. Prior to Mr. Rea's address the bridge was handed over to him by Gustav Lindenthal, designer of the bridge and chief engineer of the East River Bridge division of the railroad. Addressing the directors of the railroad he said:

"Acting under your authority, the engineers have finished their work on this bridge and railroad, and in its design of rugged strength and beauty have endeavored to express the stability of the two great railroad systems that are its sponsors."

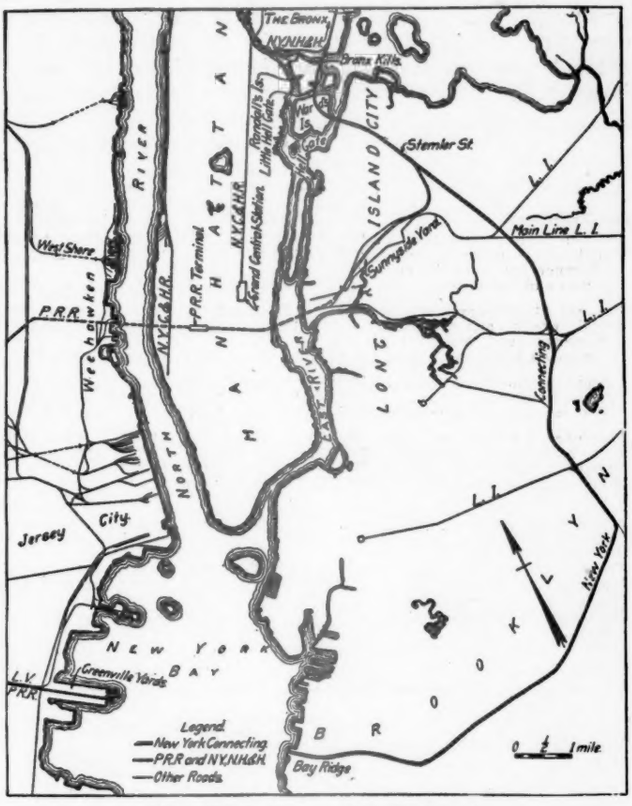
In accepting the property Mr. Rea said, in part:

"I congratulate the chief engineer and designer, Gustav Lindenthal, and the other engineers connected with this work, upon the completion of one of the notable projects of the world. . . . Informally, and yet with a deep sense of the increased obligations and responsibility of this act to the owners, the management and the officers of the Pennsylvania and New Haven systems, it is my duty and pleasure to dedicate this railroad and bridge to the transportation service of the country.

"May it prove a further link to bind our citizens and the railroad systems in closer ties of friendship, and bring increased unity of effort and service in promoting the best interests of our country, and insure greater prosperity and happiness to us all."

The New York Connecting Railroad, owned jointly by the Pennsylvania and the New Haven companies, and completing an all-rail line between New England and the South, through New York, is about six miles long. The corporation was formed 25 years ago and the bridge was begun four years ago. The property has cost over $27,000,000. The railroad is to be operated by the New Haven.

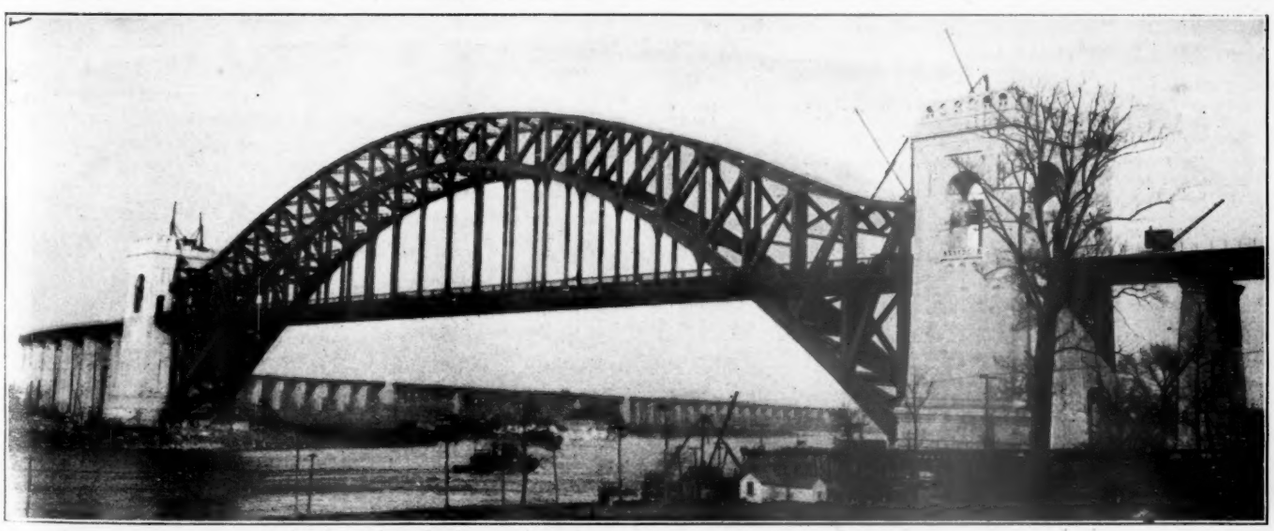
The Federal Express, the through night passenger train which formerly was run between Boston and Washington, the cars being transferred across New York Harbor by boat, will be again put in service about April 1 over this bridge.



New York Connecting Railroad

For the present the trains will be hauled by steam locomotives, the New Haven engines running to Sunnyside yard with passenger trains and to Bay Ridge with freight trains.

This enterprise was described in the *Railway Age Gazette* of September 3, 1915. The bridge is 1,000 ft. long, the longest steel arch span in the world. The elevated structure, as a whole, including the 1,000-ft. bridge, two shorter bridges, the viaducts on both sides of the river and embankments between high retaining walls, is 3½ miles long.



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Hell Gate Bridge, Looking North from Long Island Shore

RAILWAY TRAINMEN'S EARNINGS IN 1916

Effective July 1, 1915, the Interstate Commerce Commission issued a set of rules governing the classification of steam railway employees and their compensation. The returns made by railways to the commission for the fiscal year ended June 30, 1916, therefore, offer the first opportunity for tabulations based on a uniform classification of their employees. They also afford the opportunity to tabulate average number in service, aggregate compensation, and average annual and hourly earnings of railway employees.

The Bureau of Railway Economics has compiled a bulletin presenting statistics of this nature for the fiscal year 1916, covering the different classes of railway trainmen. It covers only the returns of roads of Class I—that is, those with annual operating revenues above $1,000,000. There were 178 of these roads in 1916, with an operated mileage of 231,245 miles. These roads handled more than 95 per cent of the freight and passenger traffic of the railways in 1916, so that statistics covering the number and compensation of their trainmen may be regarded as representative of the general conditions under which railway trainmen work.

The rules of the Interstate Commerce Commission define the term "railway employee" as follows: "The word *employee* is intended to include every person in the service of the reporting carrier subject to its continuing authority to supervise and direct the manner of rendition of his service."

Carriers are required to classify and count the employees in their service at four different times each year: as nearly as possible the sixteenth day of July, October, January and April. Under the rules of the commission, this count includes "every person sustaining to the carrier the relation of employee and actually in service or available for duty on the day of the count." Employees specifically excluded from the count are those absent on definite leave, those under suspension, and pensioners not bound to render service.

Under the rules of the commission, time spent while actually at work or while subject to orders is included by the carriers in their report of hours on duty. Time allowed for meals, for half holidays, holidays, absence on leave, and vacations is not included. The hours of the several classes of road and yard trainmen are governed by these rules regarding time on duty or held for duty.

The Interstate Commerce Commission classifies railway employees into 68 separate classes or groups, the classification being based upon the respective occupation of each group of employees. Fourteen of these classes comprise the general

TABLE I—COMPENSATION OF TRAINMEN, FISCAL YEAR 1916

Class of trainmen	Average Number in Service				Aggregate Compensation				Annual Earnings Per Trainman			
	United States	East'n District	South'n District	West'n District	United States	Eastern District	Southern District	Western District	United States	East'n Dist.	South'n Dist.	West'n Dist.
Road Trainmen:												
Pass. engrs. and motormen	13,153	5,976	1,798	5,379	$28,033,017.40	$11,886,257.37	$4,130,763.67	$12,015,996.36	$2,131	$1,989	$2,297	$2,234
Freight engrs. and motormen	29,305	13,948	4,857	10,500	55,009,769.93	24,676,998.64	9,031,089.53	21,301,681.76	1,877	1,769	1,859	2,029
Passenger and freight engineers and motormen	42,458	19,924	6,655	15,879	83,042,787.33	36,563,256.01	13,161,853.20	33,317,678.12	1,956	1,835	1,978	2,098
Passenger firemen and helpers	12,914	5,846	1,819	5,249	16,813,637.84	7,101,928.97	2,212,112.73	7,499,596.14	1,302	1,215	1,216	1,429
Freight firemen and helpers	31,127	14,795	5,266	11,066	35,524,877.33	16,279,930.72	5,259,817.70	13,985,128.91	1,141	1,100	999	1,264
Passenger and freight firemen and helpers	44,041	20,641	7,085	16,315	52,338,515.17	23,381,859.69	7,471,930.43	21,484,725.05	1,188	1,133	1,055	1,317
Passenger conductors	10,555	4,706	1,554	4,295	19,682,392.49	8,691,252.56	2,821,092.24	8,170,047.69	1,865	1,847	1,815	1,902
Freight conductors	23,789	10,573	4,097	9,119	38,601,890.03	16,505,222.60	6,320,876.38	15,775,791.05	1,623	1,561	1,543	1,730
Pass. and freight conductors	34,344	15,279	5,651	13,414	58,284,282.52	25,196,475.16	9,141,968.62	23,945,838.74	1,697	1,649	1,618	1,785
Passenger baggagemen	5,622	3,388	983	1,251	6,009,310.60	3,793,139.51	1,054,189.40	1,161,981.69	1,069	1,120	1,072	929
Pass. brakemen and flagmen	14,735	7,085	1,678	5,972	15,027,141.25	7,433,205.63	1,566,203.29	6,027,732.33	1,020	1,049	933	1,009
Freight brakemen and flagmen	59,268	29,586	9,845	19,837	62,602,315.60	30,221,833.11	8,965,484.91	23,414,997.58	1,056	1,021	911	1,180
Other road train employees	3,205	604	860	1,741	2,592,348.06	609,564.34	575,437.38	1,407,346.34	809	1,009	669	808
Other road trainmen	82,830	40,663	13,366	28,801	86,231,115.51	42,057,742.59	12,161,314.98	32,012,057.94	1,041	1,034	910	1,111
All road trainmen	203,673	96,507	32,757	74,409	279,896,700.53	127,199,333.45	41,937,067.23	110,760,299 85	1,374	1,318	1,280	1,489
Yard Trainmen:												
Engineers and motormen	14,749	8,353	2,060	4,336	23,642,002.41	13,275,932.14	3,177,207.49	7,188,862.78	1,603	1,589	1,542	1,658
Firemen and helpers	15,027	8,532	2,102	4,393	14,767,756.89	8,391,235.75	1,810,068.44	4,566,452.70	983	984	861	1,039
Conductors (or foremen)	14,227	7,900	2,006	4,321	20,169,731.24	11,229,890.87	2,628,270.42	6,311,569.95	1,418	1,422	1,310	1,461
Brakemen (switchmen or helpers)	37,091	21,734	5,198	10,159	44,372,802.70	26,266,269.00	5,381,002.34	12,725,531.36	1,196	1,209	1,035	1,253
All yard trainmen	81,094	46,519	11,366	23,209	102,952,293.24	59,163,327.76	12,996,548.69	30,792,416.79	1,270	1,272	1,143	1,327
All classes of trainmen	284,767	143,026	44,123	97,618	382,848,993.77	186,362,661.21	54,933,615.92	141,552,716.64	1,344	1,303	1,245	1,450

TABLE II—COMPENSATION OF TRAINMEN, FISCAL YEAR 1916

Class of trainmen	Total Number of Hours on Duty				Average Compensation Per Hour			
	United States	Eastern District	Southern District	Western District	United States (Cents)	Eastern District (Cents)	Southern District (Cents)	Western District (Cents)
Road Trainmen:								
Passenger engineers and motormen	30,983,855	14,876,919	4,194,309	11,912,627	90.48	79.90	98.50	100.87
Freight engineers and motormen	90,550,660	44,852,053	13,541,363	32,157,244	60.75	55.02	66.69	66.24
Passenger and freight engineers and motormen	121,534,515	59,728,972	17,735,672	44,069,871	68.33	61.21	74.21	75.60
Passenger firemen and helpers	29,780,869	14,400,380	4,136,735	11,243,754	56.46	49.31	53.47	66.69
Freight firemen and helpers	91,157,700	45,076,584	13,715,517	32,365,599	38.97	36.12	38.35	43.21
Passenger and freight firemen and helpers	120,938,569	59,476,964	17,852,252	43,609,353	43.28	39.31	41.85	49.27
Passenger conductors	27,527,558	12,792,537	4,016,757	10,718,264	71.50	67.94	70.23	76.23
Freight conduciors	76,970,009	35,468,855	12,355,825	29,145,329	50.15	46.53	51.16	54.13
Passenger and freight conductors	104,497,567	48,261,392	16,372,582	39,863,593	55.78	52.21	55.84	60.07
Passenger baggagemen	14,897,167	9,417,507	2,487,333	2,992,327	40.34	40.28	42.38	38.83
Passenger brakemen and flagmen	37,126,261	18,499,935	4,284,804	14,341,522	40.48	40.18	36.55	42.03
Freight brakemen and flagmen	185,637,210	94,308,195	28,115,399	63,213,616	33.72	32.05	31.89	37.04
Other road train employees	8,989,323	1,829,505	2,488,648	4,671,170	28.84	33.32	23.12	30.12
Other road trainmen	246,649,961	124,055,142	37,376,184	85,218,635	34.96	33.90	32.54	37.56
All road trainmen	593,620,612	291,522,470	89,336,690	212,761,452	47.15	43.63	46.94	52.06
Yard Trainmen:								
Engineers and motormen	54,764,700	31,275,026	7,222,169	16,267,505	43.17	42.45	43.99	44.19
Firemen and helpers	54,659,600	31,103,720	7,231,773	16,324,107	27.02	26.98	25.03	27.97
Conductors (or foremen)	52,030,638	29,194,461	6,880,946	15,955,231	38.77	38.47	38.19	39.56
Brakemen (switchmen or helpers)	126,189,694	74,254,376	16,825,221	35,110,097	35.16	35.37	31.98	36.24
All yard trainmen	287,644,632	165,827,583	38,160,109	83,656,940	35.79	35.68	34.06	36.81
All classes of trainmen	881,265,244	457,350,053	127,496,799	296,418,392	43.44	40.75	43.09	47.75

group known as railway trainmen. They are distinguished between road trainmen and yard trainmen.

"Other road train employees" includes employees such as train ticket collectors, train auditors, train electricians, train stenographers, train porters, train matrons, etc.

The statistics presented in the bulletin are grouped in five tables, which are here combined into two, giving the average number of trainmen in service during 1916 distributed among the 14 classes; the aggregate compensation during the fiscal year; the average annual earnings per trainman, computed by dividing the aggregate compensation for each class by the average earnings per hour, computed by dividing the aggre- of hours on duty, including hours held for duty; and the average earnings per hour, computed by dividing the aggregate compensation by the total number of hours on duty. The number of trainmen shown is in each case the average of the counts made on the sixteenth days of July, October, January and April, as already described.

Trainmen in the service of roads of Class I averaged 284,767 during 1916, of whom 203,673, or nearly three-fourths, were assigned to road service and 81,094 to yard service. Taking road and yard trainmen together, they are distributed among the four principal classes of engineers, firemen, conductors, and other trainmen, as follows:

Class	Number	Per cent
All trainmen	284,767	100.0
Engineers	57,207	20.1
Firemen	59,068	20.7
Conductors	48,571	17.1
Other trainmen	119,921	42.1

Taking road trainmen separately, they are distributed among the same four principal classes as follows:

Class	Number	Per cent
Road trainmen	203,673	100.0
Engineers	42,458	20.8
Firemen	44,041	21.6
Conductors	34,344	16.9
Other road trainmen	82,830	40.7

With the exception of the very small class of "other road train employees," the returns permit the separation of road trainmen as between the passenger and the freight service. This separation, so far as the returns make it possible, is as follows:

Class of service	Number	Per cent
Road trainmen	203,673	100.0
In passenger service	56,979	28.0
In freight service	143,489	70.4
Not separated	3,205	1.6

That is, nearly five-sevenths of the road trainmen are assigned to the freight service, while about two-sevenths are assigned to the passenger service.

As among the three territorial districts into which the United States is divided by the Interstate Commerce Commission, the road and yard trainmen are distributed as shown below:

District.	Road trainmen	Yard trainmen	All trainmen
United States	203,673	81,094	284,767
Eastern district	96,507	46,519	143,026
Southern district	32,757	11,366	44,123
Western district	74,409	23,209	97,618

This distribution according to districts is reduced to a percentage basis in the following table:

District.	Road trainmen	Yard trainmen	All trainmen
United States	100.0	100.0	100.0
Eastern district	47.4	57.4	50.2
Southern district	16.1	14.0	15.5
Western district	36.5	28.6	34.3

One-half of the trainmen are in the East, about one-third in the West, and the remaining sixth in the South. The number of yard trainmen is proportionately high in the East and proportionately low in the West.

The aggregate compensation of railway trainmen in the service of roads of Class I during 1916 was $382,848,993. This was distributed among the four principal groups or classes of trainmen as follows:

Class	Aggregate compensation	Per cent
All trainmen	$382,848,993	100.0
Engineers	106,684,789	27.9
Firemen	67,106,272	17.5
Conductors	78,454,014	20.5
Other trainmen	130,603,918	34.1

Limiting this same distribution by classes to road trainmen alone, the amount and percentage distribution are as follows:

Class	Aggregate compensation	Per cent
Road trainmen	$279,896,700	100.0
Engineers	83,042,787	29.7
Firemen	52,338,515	18.7
Conductors	58,284,282	20.8
Other road trainmen	86,231,116	30.8

The annual earnings of all trainmen in the service of roads of Class I in 1916 averaged $1,344 per man. The average was highest in the Western district, $1,450; next highest in the Eastern district, $1,303; and lowest in the Southern district, $1,245. This relationship between the districts did not hold for all the individual classes. Thus for road passenger engineers the average was highest in the Southern district and lowest in the Eastern district; for road passenger firemen the averages are almost the same for South and East, while both are lower than in the West; for road freight engineers the average was highest in the West and lowest in the East.

The average earnings of the four principal classes of trainmen in 1916 were as follows:

Class	Road trainmen	Yard trainmen	All trainmen
All classes	$1,374	$1,270	$1,344
Engineers	1,956	1,603	1,865
Firemen	1,188	983	1,136
Conductors	1,697	1,418	1,615
Other trainmen	1,041	1,196	1,089

The average hourly compensation of the 14 classes of road and yard trainmen for 1916 for the United States was 43.4 cents. It was 40.7 cents for the East, 43.1 cents for the South, and 47.8 cents for the West.

The average compensation of the four principal classes of road trainmen per hour on duty or held for duty was as follows:

	Cents per hour: 1916		
Class	Passenger service	Freight service	Total
Engineers	90.5	60.8	68.3
Firemen	56.5	39.0	43.3
Conductors	71.5	50.2	55.8
Other road trainmen	....	....	35.0

These averages are of actual earnings per hour, and do not represent hourly rates of pay.

REINFORCING THE POUGHKEEPSIE BRIDGE

Work is now under way on the reinforcing of the Poughkeepsie bridge of the Central New England over the Hudson River at Poughkeepsie, N. Y. The bridge was built for double track in 1889 and 1890, and was reinforced for heavier loading in 1906 and 1907.

The reinforcing will consist in changing the floor system of the main bridge in such a manner as to distribute the load equally to the three trusses from a single track placed in the center. The bridge will then be operated as single track on the main structure and double track on the approaches. The approaches will be strengthened for the heavy loading by the addition of metal in the tower bents and in the approach deck spans.

Approximately 1,800 tons of new steel will be required for reinforcing the main structure, 340 tons for the east approach and 70 tons for the west approach. The present capacity of the main bridge corresponds approximately to Cooper's E-35 train loading on each track. The reinforced main structure, operated as single track, will have a rating corresponding to Cooper's E-60 loading and will permit the use of two heavy engines of the "Santa Fe" type.

The work of reinforcing the bridge is planned so that there will be no interruption to traffic, and it is expected that the bridge will be ready for operation under the new loading basis during September, 1917. The total cost of the improvement is estimated at $330,000.

Contract for this work has been let to the Strobel Steel Construction Company. The engineers in charge are Modjeski and Angier. The steel work is being fabricated by the Fort Pitt Bridge Works of Pittsburgh.

The Threatened Strike of Trainmen

Brotherhoods Threaten to Strike Unless Managers Grant Demands Without Waiting for Court Decision

FOLLOWING conferences between the leaders of the four brotherhoods of train service employees and committees of brotherhood leaders from different sections of the country, it was announced that the brotherhood leaders would "again renew their attempt to effect a peaceful settlement [of their demands for ten hours' pay for eight hours' work] with a conference committee [of the railways] at a meeting to be held in New York, Thursday, the fifteenth." The United States Supreme Court has before it the test case which is to determine the constitutionality and meaning of the Adamson law which was designed to give the brotherhoods the increase in pay which they demanded.

Up to Thursday morning the brotherhood leaders had not made any official threat to the National Conference Committee of the railways to strike. On Wednesday a meeting of the National Conference Committee was held, following which Elisha Lee, chairman, gave out this statement:

"We are sincerely desirous that the wages and working conditions of our employees should be on the highest plane consistent with the efficient operation of the railroads. When the national wage demands of the four train brotherhoods were made last year, we felt that they were beyond reason, entailing, as they did, an annual increase of $100,000,000, or about 35%, in the wages of the 300,000 most highly paid workers in the country.

"But we were ready and anxious to submit this wage controversy for settlement to some impartial public tribunal. In the hope that our employees would join with us in seeking the judgment of such a board of inquiry, we earnestly urged that the whole case be referred to:

"1. The Interstate Commerce Commission, the government body regulating the transportation industry in the public interest; or

"2. A board of arbitration under the Newlands Arbitration Act of 1913, a law enacted at the joint request of the employees and carriers; or

"3. A board of inquiry to be appointed by the President.

"Our offers for a peaceful settlement were all rejected by the brotherhoods.

"If we had refused to meet with our employees to discuss their demands, or if we had refused to submit the issue to arbitration, this great body of workers might have been justified in leaving the service. But, under the circumstances, the threat of a nation-wide strike was indefensible.

"We left every door open for a fair determination of the merits of the controversy, and every door is still open.

"The Adamson Railroad Wage Law, hastily enacted last summer to avert the threatened strike, is now before the highest court for a determination as to its constitutionality and meaning. The railroads entered into an agreement with the government to keep the payroll records of these 300,000 employees from January 1 in such manner as to assure prompt payment to the employees of whatever amounts may be due under the construction placed upon the act by the court. The brotherhoods, on their part, publicly stated that they would take no radical action pending the decision of the court.

"Congress has made no provision, as so earnestly urged by the President, for insurance against the interruption of railroad traffic by strikes, and the country is apparently in the same position now that it was in the crisis of last August.

"The serious international situation causes every good citizen to put every thought of personal right or desire second to his duty to his country. Surely this is no time for internal industrial warfare. The reported shortage of food and the generally congested traffic of the country bring forcefully to all our minds what would happen in the event of a stoppage of the railroads of the country.

"With this situation before us, we feel confident that the patriotism and loyalty of our men will not countenance any rash movement which may seriously embarrass the government and give the impression outside our borders that this country is torn by industrial strife and, therefore, an easy prey to any foreign foe."

On Tuesday, March 13, the four leaders of the train service brotherhoods sent the following letter to President Wilson:

"We feel obligated to officially advise you of our intention to meet again the National Conference Committee of the Railways on March 15 for the purpose of making another effort to adjust the pending eight-hour controversy.

"We are very hopeful of working out a satisfactory adjustment with the railroads, but if, while we are negotiating, our country should become involved in war, we want to assure you, as Chief Executive of the nation, that we and the membership we represent can be relied upon to support you to the fullest extent and that yourself and the nation will have our hearty and full support."

After Tuesday's session of the brotherhood chiefs at Washington the following statement, signed by W. S. Stone, of the engineers; W. G. Lee, of the trainmen; W. S. Carter, of the firemen and enginemen, and L. E. Sheppard, acting president of the conductors, was given out:

"All members of the general committee representing a number of railroads in the southeastern territory conferred here today and gave thorough consideration to the application of the basic eight-hour workday as authorized by the chief executives, which was presented to and refused by the national conference committee of the railways last December.

"It was then hoped by the brotherhoods that an application of the so-called Adamson law could be agreed upon that would give train, engine and yard employees at once the benefits intended by the President when proposing the eight-hour law. The proposition submitted at today's meeting by the chief executives was unanimously indorsed by the various general committees, thus authorizing the chief executives to again renew their attempt to effect a peaceful settlement with the conference committee at the meeting to be held in New York Thursday, the fifteenth.

"All insinuations to the effect that transportation employees are not loyal citizens because of their attempt at this time to secure from their employers the benefits contemplated by the law is absurd, and assurances of our willingness and intention to support our country should war be declared has been given to the President of the United States.

"Surely, the public must recognize that for more than a year we have made every effort to secure a shorter workday, and our membership realizes that this question should be disposed of and industrial peace restored before our country becomes involved in war, which now seems probable.

"Seemingly, it has been the purpose of the railroad companies to postpone settlement of this question until either a panic or war would defeat our demands."

The following are extracts from editorials in the daily papers of Wednesday:

The New York Times

The conception of a general or widespread railroad strike at this time never took shape in any well-ordered mind, the

threat of it never issued from a brotherhood council in which wisdom had a voice, the order to strike will have neither sanction nor obedience from those members of the brotherhoods who are loyal Americans. The assurance given to the President that he can rely upon the membership of the brotherhoods to support him and the nation to the fullest extent, that trains will be moved to transport soldiers and military supplies, is worthless and void of meaning. It will not protect the men responsible for the strike threat from unsparing condemnation as unpatriotic Americans. Of what avail to transport troops and munitions if whole communities are to be cut off from supplies of food and fuel, if all the industries of the country are to be paralyzed?

The Chicago Herald

Had Congress acted as it should have acted the way would have been provided for a normal, just and wholly effective method of settling any questions in dispute. Congress did not act—it shirked the issue. The result is that in this moment of national emergency, with war perhaps a handsbreadth away, we hear talk of a possible paralysis of national transportation to enforce certain demands of the railroad brotherhoods. That there should be an actual strike under the circumstances is incredible.

New York Herald

A strike, or series of strikes, such as the leaders of the brotherhoods are now projecting, would be nothing short of a crime against the country if they should be followed by war.

To have the vitally and important transportation systems demoralized in that emergency might be disastrous, and the public does not conceive it possible that any body of intelligent American workmen can be seriously contemplating such unpatriotic action. It would turn public sentiment against the brotherhoods with disastrous effect upon their future, no matter how zealously they might labor after war began.

The World (New York)

We are not exactly at war and we may not be at war for days or weeks, but what difference morally is there between a devastating strike undertaken on the eve of war and one entered upon after hostilities have begun? Every governmental energy, as these labor leaders know, is now exerted to the utmost in preparation for war. A strike ordered at this time for any reason would be precisely what the German General Staff in Berlin would dictate if it could.

While this is the most sinister aspect of the affair, there are domestic reasons involving patriotic citizenship and respect for law which even the puissant brotherhood overlords should not overlook. The eight-hour act is still under consideration by the Supreme Court. What the judgment may be no one can say, but a strike in advance of its delivery, and without taking into consideration the merits of the case as it may then appear, would be a defiance of judicial authority so flagrant and disloyal as to admit of no defense anywhere outside of Germany.

Chicago Tribune

The railroad brotherhoods may or may not be justified in their claims for a wage raise and reformation of conditions of service, but they are certainly not justified in their method of enforcing their claims. They have threatened Congress and now they are repeating the threat against the public before the courts have had the opportunity to place an interpretation on the law the brotherhoods forced upon the statute books. It is announced that "in case of war" the brotherhoods will not interfere with the necessary movement of trains. The pretended patriotism of the brotherhoods' assurance is worthless. In peace or war or preparation for war their conduct has been ruthless and perilous to the public welfare. The next Congress, as soon as it convenes in special session, should enact appropriate legislation in defense of the public interests.

The Evening Mail (New York)

The men should have higher wages. Their pay has been stationary, while living costs have risen to the skies. They should get their wage increase. But they should get it on the basis of the justice of their claims and not because they can threaten us all with destruction.

If the Supreme Court declares the Adamson law unconstitutional, let the President summon the men and managers into the conference and on behalf of the national safety order them to arbitrate the wage question; the wage increase, when given, to apply from January 1, just as the Adamson law was to apply from then. Neither men nor managers dare refuse such a demand. If the Supreme Court rejects the Adamson law it will be because we have tried to settle this matter wrong. Then let us settle it right. This is no time for domestic war and the class which starts it will feel the full weight of the nation's outraged indignation.

Brooklyn Eagle

In the crude imagination of some labor agitators the Supreme Court of the United States is a sort of balky horse—that will go if you build a fire under him, after putting gravel in his ear has failed. That is the whole meaning of the announced plans of the railroad brotherhoods for a series of strikes, gradually tying up the traffic of the country. It is predicted that this can be accomplished by a week from tomorrow. Railroad managers have the alternative of yielding all points at issue with their employees. . . . A strike vote has already taken place. The brotherhood chiefs have the matter in their hands. They can do much of what they threaten to do. But if they carry out their plans they will injure the reputation of organized labor most gravely, and in the end only hasten a taking over of roads by Government for emergency purposes under new legislation which will tolerate no domination save that of Government. Such action is likely if war comes. It should not be made a necessity of peace times. And we venture to say that a few years of Government control would convince the labor leaders that March, 1917, conditions were not by any means the worst possible ones for their own selfish interest.

The Sun (New York)

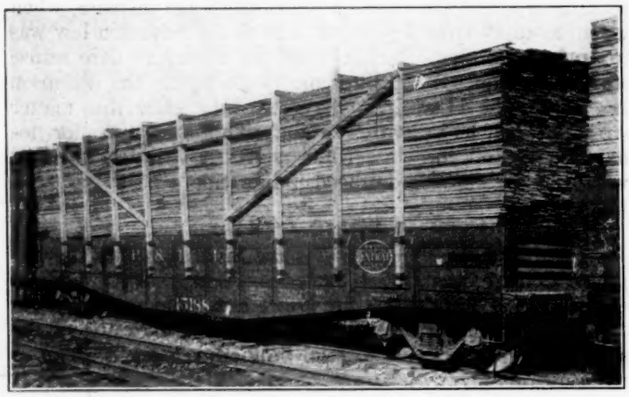
The railway brotherhoods announced that they would wait until a certain date for the decision of the Supreme Court of the United States. Will the brotherhoods gain supremacy over the judiciary of the nation?

The brotherhoods announce that in case of war they will not interfere with the transportation necessary to its conduct. Where is the line to be drawn between transportation necessary to the conduct of war and that not necessary? How could the nation carry on war if its normal activities were paralyzed? Are the railway brotherhoods to determine whether or not this nation is to carry on war, and what shall be the measure of its activity? Will the brotherhoods gain supremacy over the people of this nation?

The Australian Transcontinental.—The expected returns from the traffic on the Australian transcontinental line are an insignificant fraction of the cost of building and upkeep, but its political and strategic values are immense. It shortens the distance from London to Melbourne or Sydney by nearly a week, and likewise decreases the time between West Australia and New Zealand or America. It brings the western half of the continent in touch with the eastern by converting a strenuous two months' overland journey from Adelaide to Perth into a comfortable ride of two days.—*National Geographic Magazine.*

EFFICIENT LOADING ON THE SUNSET CENTRAL

The F. B. Williams Cypress Company, of Patterson, La., a station on Morgan's Louisiana & Texas Railroad, about 90 miles from New Orleans, loaded recently 60,747 ft. of lumber on a single car; and it is claimed that this beats all records for lumber loading. A picture of this car and load, shown herewith, gives some idea of its great bulk. It will be noticed that the pile of boards is the same height as the automobile car, standing next to the lumber car. The lumber was dry cypress, dressed, 1 inch thick; and it weighed



Quite a Load; 60,747 Board Feet; 118,100 Pounds

118,100 lb. The car is 46 ft. long inside, and weighs 47,800 lb. Its capacity, marked on its side, is 110,000 lb. The shipper took advantage of the rule permitting cars to be loaded 10 per cent above marked capacity; and worked pretty nearly to the limit.

MONROE CALCULATING-ADDING MACHINE

The Monroe calculating-adding machine shown in the illustration not only adds but subtracts, divides and multiplies. Every operation is direct; that is, the numbers are set on the keyboard as on any standard adding machine, the crank is turned forward for addition or multiplication, and backward for subtraction or division. There is no setting of levers and the operator is not hampered by the use of arbitrary rules.

The machine is simple in construction. It is portable, weighs 26 lb. and occupies less than a square foot of desk space.

In addition, the operator sets the numbers in the keyboard and gives the operating crank a turn forward. He has perfect visibility at every stage and can check each amount as he proceeds, before it is recorded on the numeral dials.

Subtraction is a direct operation and no complementary numbers are required. For example, it is desired to subtract $55,796.35 from $78,429.46. The operator sets the $78,429.46 on the keyboard, turns the crank forward, recording the number in the lower dial. He then sets the $55,796.35, turns the crank backward and the answer, $22,633.11, appears in the lower dial at the right.

To multiply, the operation is as follows: It is desired to multiply 4,346 by 122. The operator sets up 4,346 on the keyboard and turns the crank forward two times. He then shifts the carriage one space to the right and makes two more turns. The carriage is then shifted another space to the right, the crank is turned forward once and the result appears in the lower dial 530212. The three successive steps taken register on the keyboard and dials as follows:

	1st step	2nd step	3rd step
Upper dial	2	22	122
Lower dial	8692	95612	530212
Keyboard	4346	4346	4346

It is desired to divide 4775.91 by 224. As multiplication is a process of continued additions and is accomplished by turning the crank forward, so division is a process of continued subtractions and is accomplished by turning the crank backward. The operator sets the dividend 4775.91 in the keyboard and by one turn of the crank forward registers it in the lower dial. He clears the upper dial and the keyboard, and sets the divisor, 224, in the keyboard. He then turns the crank backward, subtracting 224 from the first three figures of the dividend (477) as many times as it can be subtracted, which is two. The upper dial indicates the first figure of the result. He then shifts the carriage one space to the left, again subtracts the 224 as many times as possible from the the three figures of the dividend that appear immediately above it. He continues this shifting and subtracting until no further subtraction can be made.

The figures as they show up on the machine at the end of each step are as follows:

	1st step	2nd step	3rd step	Last step
Upner dial	20.00	21.00	21.30	21.32
Lower dial	0295.91	071.91	04.71	0.23
Keyboard	224	224	224	224

The divisor, 224, remains constantly on the keyboard. At the last step the number appearing in red in the upper dial, 21.32, is the result (quotient); the number in the lower dial,



The Monroe Calculating Machine

23, is the remainder. The whole operation requires but three or four seconds. If at any stage of the division too many turns of the crank are made, a row of 9's is brought up at the left of the dividend, instantly indicating the error. To correct this, the operator merely turns the crank forward, bringing all the figures back just as they were before the error was made.

The machine has a particular use in railroad offices. Costs per ton mile can be quickly and accurately figured. The following would require about 20 seconds:

22,711,791 tons per month 75.44 miles
$16,417,899 total cost.
Answer .009581

The application to pro-rating problems is illustrated by the following example which can be figured in 15 seconds: Prorate an amount of 45,356 tons at $1.23 per ton to four different divisions of a road, at the following percentages for each division:

	Per cent	Answer
Division A	13.3	7419.788
Division B	15.4	8591.334
Division C	25.7	14337.485
Division D	45.6	25439.273
		55787.88

The machine is made by the Monroe Calculating Machine Company, Woolworth building, New York.

General News Department

A full crew bill was introduced in the Senate of the New Mexico Legislature on February 27.

A press despatch from Seward, Alaska, says that 136 miles of the government railroad are now in operation, with trains running each way daily.

The "Detroit Railroad Elevator," Detroit, Mich., was destroyed by fire March 9, together with 300,000 bushels of grain; estimated loss, $1,000,000.

H. A. Wheeler, vice-president of the Union Trust Company, Chicago, has been appointed chairman of the railroad committee of the Chamber of Commerce of the United States, succeeding Charles F. Weed, of Boston.

The Chicago, Rock Island & Pacific has paid over $405,677 in pensions between January 1, 1910, and March 1, 1917. The total number of employees pensioned during that time was 344, of whom 108 have since died.

Frank W. Thomas, superintendent of apprentices of the mechanical department of the Atchison, Topeka & Santa Fe, will deliver an address entitled "Education of Apprentices" before the Western Railway Club on March 19, at the Hotel Sherman, Chicago.

At Huntingdon, Pa., March 12, A. T. Cook, engineman, and S. K. Jacobs, flagman, were tried at a coroner's inquest on the Mount Union collision, and they were found guilty of involuntary manslaughter; and were held in bail to appear at the May term of court.

Governor Charles S. Whitman, of New York, has sent to the legislature a special message recommending the appointment of a commission, to co-operate with a similar body to be appointed by the governor of New Jersey, to take up the problem of freight congestion at the port of New York.

Since the inauguration of the safety first work on the Chesapeake & Ohio on January 1, 1913, over 2,500 out of 2,705 suggestions received from employees, or 94 per cent, have been acted upon by the various safety first committees. This action involved large expenditures which, however, the company considered money well spent.

The B. R. T. Monthly, a magazine issued by the Brooklyn Rapid Transit Company for the benefit of its employees, prints brief paragraphs giving the names of conductors who have been specially commended, usually for courtesy, by passengers who have sent letters to the general manager; and in the issue for March there are 21 such items.

D. I. Roberts, president of the United States Express Company, has brought suit in New York against the Baltimore & Ohio Railroad for $950,361 for damages in connection with breach of contract under which from 1887 to 1914 the express company did business over the Baltimore & Ohio. It is charged that beginning in 1912 the road did not accord exclusive privileges to the United States Company.

A bill providing for the electrification of the Chicago, Milwaukee & St. Paul from Chesterton street in the city of St. Paul to Minnesota Transfer was recommended for indefinite postponement on March 6 by the committee on cities of the lower house of the Minnesota legislature. The committee has held repeated hearings on the bill, at which railroad officers offered evidence to show that the operation of so short a line by electricity would involve a prohibitive expense. Railroad enginemen and firemen with homes in the Twin Cities also contended that the electrification of the road would throw them out of work or cause their removal to distant points.

In a state court at Scranton, Pa., March 9, a decision by Judge Head was handed down recognizing a dining car employee as a member of the train crew. The Public Service Commission of that state had decided that, in counting members of the crew in connection with the "full-crew" law of that state, a dining car man must be omitted; but this view is now reversed by the court. The suit was brought by the Baltimore & Ohio. From the newspaper reports, it appears that Judge Head held that the train in question was manned by the number of employees named in the law, each one of whom was fully competent to perform the services indicated by the terms of the statute.

The Department of Justice has filed in the United States Supreme Court a brief for the government in the Lehigh Valley lake line case, in which the railroad appealed from a decision of the district court for the eastern district of Pennsylvania sustaining the order of the Interstate Commerce Commission, requiring the railroad to sever its connection with the Lehigh Valley Transportation Company operating on the Great Lakes. The department contends in its brief that the lake line is used by the railroad to suppress and to keep suppressed independent boat line competition on the Great Lakes. The railroad contended that the lake line was an extension of and could not compete with its rail line which terminates at Buffalo.

Car Service Rules Postponed

The Interstate Commerce Commission on Wednesday again changed the date on which its car-interchange order shall take effect, making it April 15.

Railway Earnings in January

A preliminary report issued this week by the Interstate Commerce Commission shows, for 181 large roads, for January, gross revenues per mile of $1,303, against $1,136 last year; expenses $931 against $800; net revenues $372 against $336.

What Could the Note Have Said?

An Iowa court, in a suit against the Rock Island road, has decided that a railroad company does not, by entrusting torpedoes to a brakeman, become liable for bodily injury caused by a brakeman using one for a weight to aid in delivering a personal note to a person living near the railroad by throwing it from the train.

Life Insurance for C. G. W. Employees

The Chicago Great Western has provided life insurance for those section foremen and shop employees who have been in the service of the company at least one year. The policies are equal in amount to one year's pay with a minimum payment of $500 and a maximum of $2,000. There will be no expense of any kind to the insured, nor will any physical examination be required. When employees leave the road, the policies automatically become void. Nearly 850 men are affected by the plan, which became operative on March 1. The scheme is an experiment, and if it proves satisfactory will be extended to other classes of employees.

Advertising for the Farmer

The Railway Executives' Advisory Committee has inserted in a selected list of farm papers a series of advertisements emphasizing the interest of the farmer in an improvement in the system of railroad regulation. The first advertisement is headed "Farm Values and Railroads," and emphasizes the point that the transportation problem must be solved nationally in order to secure agricultural prosperity. The second is headed "What Every Farmer Wants," and shows that cheap and efficient transportation is the greatest need of the farmer. The third is headed "Better Prices and Proper Markets," and argues that improvement of transportation facilities will be of greater advantage to the farmer than cheapness of transportation. All of the advertisements advocate the policy of centralization of railway regulation in the hands of the Interstate Commerce Commission.

REVENUES AND EXPENSES OF RAILWAYS

Month of December, 1916

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of: Way and structures.	Equipment.	Traffic.	Transportation.	Miscellaneous.	General	Total.	Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Atlantic & St. Lawrence	167	$143,949	$26,598	$191,092	$23,379	$39,914	$4,496	$100,068	.....	$5,958	$173,816	$17,277	$53,074	—$35,797	—$89,577
Atlantic City	170	70,222	66,831	149,904	28,440	18,611	2,300	94,612	$98	489	144,461	5,443	15,000	—9,674	2,393
Chicago, Burlington & Quincy	9,374	6,766,921	1,937,278	9,749,415	755,197	1,569,254	130,865	3,089,766	95,445	198,333	5,328,333	4,421,082	532,446	3,861,869	169,455
Chicago, Detroit, & Can. Gd. Trunk Jctn.	60	61,550	23,224	91,909	13,238	19,470	1,556	45,331	.....	1,792	81,388	10,521	—14,577	25,094	—7,842
Detroit, Grand Haven & Milwaukee	191	218,775	37,539	278,211	21,573	38,837	5,586	162,374	195	6,494	235,059	43,152	—12,830	55,976	2,670
Grand Trunk Western	347	599,331	90,651	735,238	77,763	135,180	16,619	316,798	7,137	16,363	569,860	165,379	—126,998	281,689	160,902
Kanawha & Michigan	177	220,614	33,053	263,567	12,035	84,907	2,984	75,269	11	6,424	181,629	81,939	14,200	67,739	—33,292
Michigan Central	1,846	2,593,550	1,047,042	4,153,785	386,002	568,179	82,486	1,664,799	81,798	88,943	2,872,208	1,281,577	136,010	1,141,990	142,525
New Orleans, Mobile & Chicago	402	119,427	34,262	166,699	32,810	7,944	4,124	56,189	5	6,281	107,353	59,345	11,148	47,964	—8,411
New York Central R. R.	6,073	10,784,802	4,705,992	18,053,437	716,199	2,616,925	269,525	7,004,169	261,069	455,227	11,323,115	6,730,322	832,770	5,897,036	364,926
Oahu Ry. & Land Co	114	60,925	26,938	94,845	11,584	8,286	1,073	27,627	.....	16,924	65,494	29,351	4,488	24,863	9,719
Philadelphia & Reading	1,127	4,048,524	652,366	5,017,292	364,056	604,323	42,605	2,042,116	12,214	87,392	3,150,477	1,866,815	354,643	1,511,691	—637,881
Pittsburgh & Lake Erie	225	1,554,843	183,251	1,885,405	150,995	281,751	12,166	517,136	4,936	38,506	1,005,490	879,915	95,494	784,401	—159,024
Port Reading	21	81,746	.....	96,455	11,398	16,562	38	84,269	.....	216	112,077	—15,622	—30,000	14,378	—69,917
Toledo & Ohio Central	436	437,424	51,888	523,134	45,774	132,104	6,671	221,178	1,610	10,323	417,660	105,474	34,900	69,843	4,263

Six Months of Fiscal Year 1917

Atlantic & St. Lawrence	167	$711,566	$166,997	$954,243	$204,735	$190,225	$26,157	$510,621	.....	$32,287	$964,024	—$9,781	$102,549	—$112,359	—$218,270
Atlantic City	170	489,113	1,092,985	1,663,756	189,942	151,872	24,296	742,017	$675	9,261	1,117,451	546,305	65,000	481,123	127,713
Chicago, Burlington & Quincy	9,374	41,701,914	12,177,352	59,091,189	5,955,776	8,940,832	825,271	16,842,500	500,061	1,167,907	33,721,820	25,369,369	2,520,969	22,821,632	2,912,094
Chicago, Detroit & Can. Gd. Trunk Jctn.	60	372,776	123,414	598,996	81,890	77,472	9,314	288,610	.....	9,198	466,484	132,512	2,858	129,645	—24,313
Detroit, Grand Haven & Milwaukee	191	1,089,775	342,539	1,674,804	245,452	230,404	33,890	872,592	4,544	32,414	1,419,296	255,508	6,985	248,144	—290,810
Grand Trunk Western	347	3,472,331	872,651	4,676,821	512,779	816,165	102,380	1,717,624	45,377	90,398	3,284,723	1,392,099	56,187	1,323,996	23,953
Kanawha & Michigan	177	1,447,752	203,862	1,704,747	223,608	490,488	18,190	440,948	47	40,938	1,214,218	490,530	84,500	406,022	—210,900
Michigan Central	1,846	15,381,758	6,249,495	24,516,809	2,688,379	3,445,763	431,234	8,622,921	378,143	457,475	16,023,915	8,492,893	846,010	7,640,113	1,678,069
New Orleans, Mobile & Chicago	402	778,219	173,138	1,006,934	159,024	142,342	25,002	317,028	333	39,852	683,581	323,353	47,875	274,987	—1,489
New York Central R. R.	6,083	70,216,085	28,805,959	115,215,830	10,339,364	19,507,583	1,662,710	37,178,394	1,611,193	2,475,322	72,774,567	42,441,263	4,692,796	37,738,787	3,101,688
Oahu, Ry. & Land Co	114	509,699	139,196	689,266	65,112	50,064	5,457	163,342	.....	41,805	325,657	363,610	46,976	316,633	—26,407
Philadelphia & Reading	1,127	25,404,845	3,811,102	30,957,279	2,100,697	4,282,579	286,997	10,463,634	73,182	541,360	17,736,756	13,220,523	938,214	12,279,348	1,316,663
Pittsburgh & Lake Erie	225	10,614,708	1,122,391	12,566,130	1,027,980	1,945,408	85,186	2,895,961	26,660	205,063	6,186,258	6,379,872	484,494	5,895,356	—184,846
Port Reading	21	780,762	.....	911,174	65,078	105,283	230	381,070	.....	1,876	553,130	358,043	20,000	338,043	—109,291
Toledo & Ohio Central	436	2,855,773	342,412	3,450,216	405,939	711,325	43,692	1,173,690	10,861	62,235	2,407,742	1,042,474	155,180	886,396	209,822

Month of January, 1917

Alabama & Vicksburg	143	$116,635	$37,646	$170,886	$24,296	$25,453	$4,355	$61,860	$2,924	$5,769	$124,658	$46,228	$10,800	$35,428	$7,745
Alabama Great Southern	312	379,179	111,791	536,187	54,909	101,454	17,828	163,638	2,785	12,038	352,652	183,536	19,577	163,933	37,204
Ann Arbor	294	188,759	42,005	243,817	26,577	42,698	5,351	98,925	313	9,590	183,454	60,363	13,100	47,165	976
Arizona Eastern	378	305,286	51,505	379,036	48,718	31,034	2,435	75,016	3,255	13,216	173,468	205,568	16,092	189,472	130,941
Atchison, Topeka & Santa Fe	8,648	7,387,275	2,478,725	10,674,019	1,034,792	1,778,885	182,100	3,355,149	5,540	222,309	6,567,989	4,106,030	504,686	3,600,461	1,571,868
Atlanta & West Point	93	69,323	46,514	132,484	14,628	22,433	7,962	41,375	2,385	5,059	93,843	38,641	7,195	31,339	6,089
Atlanta, Birmingham & Atlantic	640	232,072	48,620	302,468	41,220	51,029	15,204	125,869	73	10,410	243,805	58,663	13,700	44,963	17,567
Atlantic & St. Lawrence	167	120,169	19,258	151,046	25,565	29,497	4,133	106,047	.....	6,098	171,340	—20,294	10,721	—31,015	—51,828
Atlantic City	170	70,978	60,435	141,675	26,464	6,775	2,384	109,392	104	940	145,963	—4,288	10,000	—14,299	10,223
Atlantic Coast Line	4,774	2,428,391	976,080	3,710,500	401,549	529,476	73,783	1,143,381	18,148	81,177	2,244,042	1,466,458	180,000	1,286,046	349,152
Baltimore & Ohio	4,545	7,659,080	1,320,342	9,772,353	950,090	1,992,667	167,020	3,693,224	71,252	253,250	7,126,234	2,646,118	363,111	2,282,490	530,726
Baltimore & Ohio Chicago Terminal	79	.....	437	146,382	6,473	33,656	919	120,200	1,352	6,435	167,582	—21,199	22,689	—43,887	—38,983
Baltimore, Chesapeake & Atlantic	88	42,924	22,006	68,719	7,461	11,030	998	42,758	.....	2,547	64,794	3,925	2,291	1,634	4,916
Bangor & Aroostook	632	336,300	55,803	411,217	51,738	59,573	3,931	121,677	3,282	11,641	251,841	159,376	15,000	144,376	34,591
Belt Ry. Co. of Chicago	31	.....	.....	290,334	18,640	47,068	1,298	180,419	.....	6,544	253,970	36,364	13,265	23,099	—20,284
Bessemer & Lake Erie	205	474,304	25,470	519,483	58,634	227,208	9,656	200,765	.....	17,369	507,483	12,000	19,100	—7,104	—118,093
Bingham & Garfield	36	206,066	6,286	215,415	19,126	31,554	1,733	38,794	51	2,437	93,695	121,720	2,413	119,307	25,975
Boston & Maine	2,298	2,746,226	1,271,738	4,518,279	448,783	659,957	33,388	2,268,086	19,960	100,327	3,530,499	987,780	171,086	816,694	—157,564
Buffalo & Susquehanna R. R. Corporation	253	131,031	6,339	139,708	19,877	40,390	1,434	42,066	.....	5,935	109,702	30,006	2,600	27,406	—21,342
Buffalo, Rochester & Pittsburgh	586	908,184	97,632	1,035,009	105,314	300,839	15,344	393,921	1,413	25,292	842,123	192,886	25,000	167,882	—72,857
Canadian Pacific Lines in Maine	234	274,919	13,828	299,189	14,077	37,743	5,770	131,214	.....	5,912	194,715	104,474	5,500	98,974	19,508
Carolina, Clinchfield & Ohio	283	308,989	20,157	337,188	26,481	43,222	16,105	61,089	.....	12,131	158,585	178,603	13,400	165,203	49,651
Carolina, Clinchfield & Ohio of S. C.	18	14,602	1,381	16,592	1,071	94	2,503	3,392	.....	1,001	8,060	8,531	600	7,931	—816
Central of Georgia	1,919	775,979	299,086	1,198,378	178,098	221,025	42,763	404,790	1,382	39,330	885,357	313,021	55,313	257,137	40,837
Central of New Jersey	684	2,092,057	469,768	2,798,487	243,783	532,203	35,673	1,092,264	11,899	60,768	1,976,242	822,246	172,626	649,620	—113,001
Central New England	301	395,414	28,721	446,132	75,592	52,105	1,050	151,564	.....	7,833	288,127	158,005	17,000	141,005	45,317
Central Vermont	411	227,484	75,059	337,143	30,875	46,655	8,394	174,353	2,521	10,763	273,561	63,582	15,565	48,006	—17,827
Charleston & Western Carolina	343	131,714	33,269	172,029	32,455	20,290	4,013	63,539	.....	3,228	123,524	48,505	6,500	41,936	—97
Chesapeake & Ohio Lines	2,381	3,455,626	505,633	4,220,831	489,739	828,211	59,150	1,341,496	27,988	88,164	2,832,729	1,388,102	134,500	1,253,427	60,546
Chicago & Alton	1,053	1,075,146	342,540	1,533,383	150,128	326,427	39,558	569,024	10,065	34,373	1,129,537	403,845	47,501	356,124	110,250
Chicago & Eastern Illinois	1,131	1,213,753	275,721	1,615,681	156,645	449,063	25,893	600,717	10,413	38,003	1,275,682	339,999	61,000	278,836	23,158
Chicago & Erie	270	520,291	45,062	617,927	56,867	93,057	18,949	300,228	2,699	15,339	486,107	131,820	31,275	100,545	—75,632
Chicago & North Western	8,108	5,220,899	1,805,322	7,881,306	670,399	1,360,550	107,714	3,244,894	63,684	203,847	5,638,177	2,243,129	425,000	1,817,714	333,681
Chicago, Burlington & Quincy	9,373	6,884,654	1,867,257	9,590,840	685,030	1,500,669	139,889	3,180,260	114,726	215,126	5,835,701	3,755,140	421,680	3,333,460	673,038
Chicago, Detroit & Can. Gd. Trunk Jctn.	60	64,071	15,118	96,449	8,680	17,341	1,458	64,218	.....	2,033	93,730	2,719	3,546	—827	—28,463

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF JANUARY, 1917—CONTINUED

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance of—										
		Freight.	Passenger.	Total (inc. misc.)	Way and structures.	Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Chicago Great Western	1,496	$917,372	$304,991	$1,332,063	$122,785	$236,270	$47,997	$523,632	$11,350	$78,294	$1,019,903	$312,160	$50,000	$261,325	—$54,107
Chicago, Indianapolis & Louisville	622	553,324	147,867	762,540	69,572	150,821	21,368	280,392	553	20,239	542,517	220,023	31,388	188,570	34,683
Chicago Junction	13	.....	.....	238,086	24,675	25,471	1,304	162,720	.....	5,790	219,960	18,126	2,885	15,269	—8,306
Chicago, Milwaukee & St. Paul	10,208	5,807,395	1,531,564	8,351,113	595,039	1,568,402	138,724	3,845,996	63,454	160,721	6,220,807	2,130,306	465,193	1,662,325	83,674
Chicago, Peoria & St. Louis	255	144,732	22,889	176,379	21,881	37,866	5,739	67,215	.....	6,205	138,906	37,472	6,000	31,454	17,953
Chicago, Rock Island & Gulf	477	233,604	63,564	318,400	45,581	50,456	9,289	106,503	1,148	9,196	222,141	96,259	10,000	86,232	9,051
Chicago, Rock Island & Pacific	7,656	4,630,433	1,576,565	6,755,530	827,776	1,272,416	134,476	2,685,522	44,809	164,498	5,088,402	1,667,127	313,417	1,352,894	338,167
Chicago, St. Paul, Minn. & Omaha	1,753	1,055,554	432,806	1,620,679	146,497	246,978	30,511	680,768	15,951	44,937	1,164,968	455,710	91,603	363,896	17,108
Chicago, Terre Haute & Southeastern	373	264,144	16,417	287,068	23,024	65,294	4,860	94,869	2,155	7,845	198,047	89,021	11,833	77,187	7,679
Cincinnati, Hamilton & Dayton	622	620,439	103,940	816,147	119,246	177,128	14,275	381,200	2,750	38,825	731,294	84,854	34,570	50,203	—58,712
Cincinnati, Indianapolis & Western	322	168,456	41,984	230,909	17,081	30,588	8,219	94,180	498	7,692	158,235	72,673	9,166	63,507	32,004
Cincinnati, New Orleans & Texas Pacific	337	763,061	251,184	1,082,889	97,636	219,014	30,028	327,043	7,226	20,444	701,391	381,498	40,000	341,492	69,514
Cincinnati Northern	246	171,652	16,024	193,282	25,178	34,897	2,913	72,180	.....	3,428	138,597	54,685	7,000	47,685	13,926
Cleveland, Cincinnati, Chic. & St. Louis	2,387	2,791,341	839,288	4,001,801	343,538	809,250	80,754	1,623,826	26,039	85,606	2,966,874	1,034,927	160,000	874,138	18,248
Coal & Coke	197	78,938	15,954	98,870	14,154	27,548	1,082	32,530	.....	2,896	78,210	20,660	5,000	15,660	3,988
Colorado & Southern	1,103	733,806	122,124	950,611	68,880	129,690	8,913	260,061	4,141	25,675	497,360	453,251	4,500	408,064	194,852
Colorado Midland	338	100,659	11,710	122,355	12,925	35,522	6,639	60,653	947	5,168	121,854	501	9,000	—8,499	—11,926
Cripple Creek & Colorado Springs	87	100,140	12,691	114,555	8,630	14,900	1,514	27,344	.....	3,134	55,522	59,033	3,000	56,033	10,077
Cumberland Valley	164	240,061	54,002	310,683	24,842	34,248	4,493	112,753	1,102	8,991	184,637	126,046	8,494	117,552	—15,266
Delaware & Hudson Co.—R. R. Dept.	886	1,841,866	194,736	2,153,543	203,784	518,771	27,000	885,981	19,619	80,202	1,731,429	422,114	62,590	359,524	—362,544
Delaware, Lackawanna & Western	955	3,257,048	680,555	4,434,677	271,618	714,692	75,688	1,602,180	33,585	85,597	2,781,303	1,653,373	231,866	1,419,556	—162,370
Denver & Rio Grande	2,578	1,765,124	289,507	2,203,763	193,593	387,356	40,327	694,984	25,271	71,041	1,412,573	791,190	95,000	696,121	181,024
Denver & Salt Lake	255	117,889	16,389	139,411	23,032	45,140	1,655	76,546	.....	4,688	151,062	—11,651	8,250	—19,901	—27,599
Detroit & Mackinac	383	54,291	27,642	89,421	11,942	24,090	2,155	38,504	.....	3,588	80,280	9,141	8,064	1,078	—12,938
Detroit & Toledo Shore Line	81	156,965	.....	157,474	7,794	9,143	1,474	49,368	.....	2,895	70,674	86,800	5,643	81,157	—17,056
Detroit, Grand Haven & Milwaukee	191	145,000	46,000	221,721	23,732	37,782	5,249	167,922	187	6,011	240,883	—19,162	3,620	—22,782	—25,208
Detroit, Toledo & Ironton	441	190,894	12,634	218,709	17,623	30,797	4,059	118,990	.....	8,944	180,414	38,295	8,000	30,446	4,362
Duluth & Iron Range	270	68,981	23,183	104,260	45,101	68,263	1,189	84,789	965	11,451	211,759	—107,498	5,686	—113,184	—23,044
Duluth, Missabe & Northern	414	115,126	31,063	169,847	109,729	105,964	3,613	105,031	1,256	13,914	339,507	—169,659	7,889	—177,548	—26,528
Duluth, South Shore & Atlantic	600	211,794	69,805	301,174	48,359	43,659	6,379	132,593	4,027	8,710	243,727	57,447	18,000	39,447	6,654
El Paso & South Western	1,028	977,323	200,537	1,237,182	121,176	138,581	21,786	301,067	6,454	29,358	618,422	618,760	38,643	580,117	287,736
Elgin, Joliet & Eastern	800	1,096,672	14	1,188,754	99,344	311,015	8,770	412,048	.....	19,442	849,942	338,812	48,040	290,767	—109,542
Erie	1,988	3,667,648	732,639	4,984,169	456,992	1,446,040	97,612	2,441,923	37,592	122,832	4,602,175	381,994	224,485	156,816	—862,178
Florida East Coast	765	383,973	292,281	793,300	72,182	81,250	15,640	198,241	5,053	17,735	386,997	406,303	25,917	380,355	94,524
Fort Worth & Denver City	454	398,930	129,853	574,289	56,163	91,417	6,911	157,259	2,597	17,478	331,826	242,463	17,000	225,458	74,404
Galveston, Harrisburg & San Antonio	1,361	1,083,031	330,794	1,486,831	183,967	207,616	35,755	538,691	12,075	39,051	1,010,082	476,749	51,311	425,052	393,012
Galveston Wharf	14	.....	.....	125,836	1,889	1,378	410	25,674	23,896	688	53,935	71,900	10,500	61,400	14,694
Georgia	307	195,230	76,416	294,751	28,638	44,845	13,391	120,639	138	8,582	216,167	78,584	4,965	73,616	13,922
Georgia, Southern & Florida	402	140,195	84,192	257,732	37,460	48,108	7,549	90,997	67	9,596	193,728	64,003	12,121	51,823	7,158
Grand Canyon	64	307	17,685	34,069	5,420	1,549	674	16,146	.....	160	23,943	10,126	1,463	8,663	—15,650
Grand Rapids & Indiana	575	333,189	116,222	489,183	65,112	89,444	9,747	210,725	334	18,990	394,352	94,831	22,205	72,619	27,786
Grand Trunk Western	347	485,200	120,000	667,490	47,704	149,791	15,383	345,217	6,961	17,038	582,095	85,395	37,235	47,858	—118,056
Great Northern	8,198	4,030,376	1,052,252	5,680,931	606,435	1,003,274	94,621	2,355,008	86,220	121,529	4,218,767	1,462,164	384,728	1,077,235	63,826
Gulf & Ship Island	308	137,233	29,020	177,384	16,210	22,874	2,634	57,710	354	8,487	108,267	69,117	9,719	59,397	—1,184
Gulf, Colorado & Santa Fe	1,938	1,106,299	238,252	1,425,082	224,934	208,859	28,202	453,881	.....	52,462	967,632	457,449	59,483	396,895	197,091
Hocking Valley	350	589,713	74,610	693,716	66,998	173,143	9,892	229,481	.....	17,187	496,700	197,016	49,000	148,014	59,277
Houston, East & West Texas	191	113,278	27,557	151,458	17,614	16,980	2,294	51,028	731	3,323	91,639	59,819	5,863	53,942	30,987
Houston & Texas Central	918	451,506	116,751	620,677	96,102	73,942	17,344	204,445	4,673	18,857	414,273	206,405	34,367	171,780	134,891
Illinois Central	4,766	4,891,099	1,355,636	6,794,386	843,432	1,501,491	114,398	2,219,920	45,704	167,291	4,870,727	1,923,659	366,217	1,556,623	422,737
Indiana Harbor Belt	109	.....	.....	419,724	30,090	55,322	3,483	203,403	.....	8,942	300,880	118,844	8,374	110,470	2,215
International & Great Northern	1,160	634,992	187,943	901,622	133,535	155,490	20,647	373,783	5,390	29,856	705,647	195,975	40,000	155,944	60,095
Kanawha & Michigan	177	224,180	28,850	262,289	39,501	69,284	2,786	75,918	49	7,769	195,307	66,981	18,425	48,551	—30,307
Kansas City, Mexico & Orient of Texas	466	85,881	18,206	110,417	17,458	20,713	3,624	57,918	.....	4,779	104,492	5,925	5,500	420	21,655
Kansas City Southern	837	849,466	135,226	1,072,958	109,581	130,520	27,554	337,116	.....	32,984	634,789	438,169	58,055	379,183	178,228
Lake Erie & Western	900	596,293	58,942	685,007	60,915	111,993	12,670	243,052	.....	14,514	443,144	241,863	25,000	216,859	78,733
Lehigh & Hudson River	97	154,982	3,991	178,930	21,631	35,580	1,493	68,863	.....	4,589	132,157	46,772	5,600	41,172	—7,555
Lehigh & New England	296	264,822	1,474	282,071	33,387	49,428	2,091	79,414	.....	8,559	172,878	109,193	8,835	100,358	—5,230
Lehigh Valley	1,443	2,986,745	338,373	3,658,142	452,438	711,884	89,704	1,773,640	14,874	95,146	3,136,033	522,109	161,000	361,008	—358,378
Long Island	397	336,107	573,519	1,051,095	148,712	129,320	10,209	515,699	5,836	37,565	846,809	204,287	73,854	130,407	21,694
Los Angeles & Salt Lake	1,154	528,093	274,666	891,141	97,192	169,493	32,864	288,984	20,575	23,950	623,804	267,337	51,854	215,182	40,608
Louisiana & Arkansas	302	96,364	18,960	119,743	23,842	18,969	3,727	37,624	.....	4,401	88,562	31,180	10,118	21,061	12,789
Louisiana Ry. & Nav. Co	342	164,749	23,072	199,714	27,264	18,843	6,457	70,006	.....	6,963	129,532	70,182	14,500	55,651	16,929
Louisiana Western	208	182,667	71,131	269,801	24,909	29,872	8,154	75,397	1,893	6,854	147,032	122,769	14,571	108,170	56,976
Louisville & Nashville	5,076	4,381,961	1,172,185	5,956,240	666,748	1,056,495	150,417	1,786,376	37,018	119,414	3,802,091	2,154,149	224,387	1,927,880	356,093
Louisville, Henderson & St. Louis	200	118,481	32,930	160,883	19,541	20,274	4,885	55,675	.....	3,481	103,856	57,027	3,800	53,223	18,392
Maine Central	1,221	751,972	232,675	1,069,171	140,921	173,182	10,269	514,320	926	26,392	865,963	203,208	58,706	144,451	—51,487
Michigan Central	1,862	2,665,307	952,773	4,061,055	391,882	610,386	70,168	1,835,747	64,356	85,425	3,057,965	1,003,090	156,000	845,600	41,383
Midland Valley	385	149,837	42,459	201,087	35,497	26,849	2,964	69,463	.....	7,510	142,283	58,804	5,138	53,561	24,018
Mineral Range	120	96,331	3,208	101,513	21,702	22,327	550	49,925	.....	1,278	95,782	5,731	3,000	2,731	13,071
Minneapolis & St. Louis	1,647	647,468	156,330	873,558	98,131	148,951	20,804	359,516	94	24,746	652,242	221,317	43,438	177,858	—71,403
Minneapolis, St. Paul & S. S. Marie	4,228	1,684,238	631,838	2,541,299	201,047	359,949	44,778	919,551	16,018	65,625	1,592,243	949,056	108,891	840,165	—159,387
Missouri & North Arkansas	365	81,932	32,479	122,391	21,606	16,850	4,168	40,702	.....	5,328	88,654	33,737	4,800	28,778	45,384
Missouri, Kansas & Texas System	3,865	2,343,621	803,906	3,409,177	727,512	672,988	69,379	1,262,787	22,375	118,912	2,873,904	535,273	129,525	404,817	450,298

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF JANUARY 1917—CONTINUED

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance of—										
		Freight.	Passenger.	Total (inc. misc.)	Way and structures.	Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Missouri, Oklahoma & Gulf	334	$137,963	$22,354	$166,598	$16,377	$30,598	$4,495	$76,857	$237	$7,634	$136,199	$30,399	$7,624	$22,774	$64,553
Missouri, Oklahoma & Gulf of Texas	134	29,226	378	29,766	3,526	2,991	1,881	12,959	.....	1,867	23,225	6,542	184	6,358	7,994
Missouri Pacific	3,928	2,137,094	414,060	2,800,381	435,635	513,061	69,748	1,100,617	7,535	66,137	2,179,070	621,312	114,000	506,005	232,783
Mobile & Ohio	1,160	964,238	118,129	1,143,882	131,337	242,714	40,288	369,065	2,448	32,003	817,855	326,027	40,390	285,328	82,063
Monongahela	108	155,698	10,084	168,472	21,636	20,289	972	44,935	.....	4,065	91,897	75,576	6,000	70,576	—8,045
Monongahela Connecting	6	.....	.....	177,964	30,183	23,263	357	65,618	.....	4,012	123,432	48,531	1,682	46,849	36,732
Morgan's La. & Texas R. R. & S. S. Co.	401	358,964	110,793	504,264	48,930	75,356	12,330	148,091	2,309	11,785	298,785	205,479	27,705	177,719	133,994
Nashville, Chattanooga & St. Louis	1,237	808,795	261,681	1,203,198	123,060	217,049	59,569	461,011	16,395	38,094	914,674	288,524	30,000	258,323	14,378
Nevada Northern	165	162,816	12,214	179,030	16,085	17,062	760	34,278	74	4,663	72,923	106,107	8,000	98,107	20,538
New Orleans & North Eastern	204	305,825	52,402	403,099	29,322	68,243	10,306	123,244	9,669	11,722	252,505	150,594	19,300	131,294	58,129
New Orleans Great Northern	285	118,084	25,079	152,708	13,251	22,899	3,261	44,980	243	6,559	91,194	61,515	6,225	55,146	—2,920
New Orleans, Texas & Mexico	191	85,832	24,604	114,435	20,807	14,547	6,925	35,918	.....	6,615	84,813	29,623	1,400	28,223	5,743
New York Central Railroad	5,083	10,876,643	4,292,854	17,579,050	1,692,272	3,415,110	258,174	6,984,445	294,487	421,659	13,066,146	4,512,904	880,481	3,626,854	—1,103,610
New York, Chicago & St. Louis	571	1,192,869	99,566	1,339,873	102,471	209,540	47,036	688,648	4,559	30,221	1,082,328	257,544	50,000	207,542	—79,365
New York, New Haven & Hartford	2,009	3,301,670	2,564,483	6,712,001	635,339	871,764	39,168	2,851,192	102,818	211,066	4,710,161	2,001,840	275,000	1,726,687	306,225
New York, Ontario & Western	568	452,853	78,786	633,528	56,689	116,924	9,301	294,188	.....	19,565	496,667	136,861	18,000	118,861	—36,118
New York, Philadelphia & Norfolk	112	371,477	41,192	442,194	41,799	75,449	4,735	156,931	5,565	13,023	297,474	144,720	13,500	131,173	30,553
New York, Susquehanna & Western	140	214,281	48,265	294,792	25,757	36,582	1,881	154,902	.....	5,371	224,481	70,310	16,167	54,144	—34,163
Norfolk & Western	2,085	4,304,990	467,633	4,962,151	437,042	843,311	64,872	1,401,360	10,081	97,439	2,848,404	2,113,747	230,000	1,883,674	164,033
Norfolk Southern	908	310,704	92,243	430,591	51,248	65,853	7,747	146,354	80	19,677	290,959	139,632	15,015	124,610	32,771
Northern Pacific	6,514	4,710,020	1,043,390	6,289,475	485,392	734,400	99,402	2,159,714	97,225	114,887	3,627,906	2,661,569	432,542	2,227,344	197,273
Northwestern Pacific	507	165,082	118,287	316,809	67,464	44,246	4,482	124,479	961	12,043	253,311	63,498	18,254	45,242	66,335
Oregon Short Line	2,307	1,597,508	386,389	2,154,791	198,788	277,924	39,152	660,830	37,068	80,189	1,289,519	865,272	143,410	721,442	67,055
Oregon-Washington R. R. & Nav. Co.	2,052	958,191	363,205	1,439,019	204,919	182,890	45,640	546,654	17,701	73,760	1,066,436	372,583	99,600	272,962	225,638
Panhandle & Santa Fe	670	402,458	86,637	510,622	66,304	89,014	4,340	133,922	.....	12,560	306,015	204,606	14,024	190,582	39,067
Pennsylvania Company	1,755	3,696,425	1,030,073	5,338,286	711,162	1,111,748	81,026	2,624,973	44,911	153,593	4,725,107	613,179	348,436	264,717	—864,470
Pennsylvania Railroad	4,536	13,430,938	3,801,446	19,032,422	2,560,985	3,878,413	213,644	7,289,300	307,991	531,254	14,773,396	4,259,026	773,197	3,484,339	—308,251
Peoria & Pekin Union	19	14,197	6,193	101,802	8,685	14,182	10	58,625	.....	2,910	84,411	17,391	7,500	9,891	—2,728
Pere Marquette	2,249	1,207,327	336,435	1,759,810	123,144	423,142	37,756	858,170	4,735	61,890	1,508,186	251,623	47,369	200,991	—208,688
Philadelphia & Reading	1,127	4,357,468	595,309	5,356,422	290,187	791,500	41,580	2,205,504	13,400	97,506	3,435,015	1,921,407	137,497	1,783,033	—255,185
Philadelphia, Baltimore & Washington	718	1,065,152	934,715	2,208,700	289,633	425,611	28,402	925,681	274	56,234	1,724,291	484,409	65,926	418,476	79,007
Pittsburgh & Lake Erie	225	1,475,965	170,042	1,804,669	199,932	379,971	18,310	577,632	4,921	40,156	1,220,921	583,747	85,200	498,547	—318,812
Pittsburgh, Cincinnati, Chic. & St. Louis	2,399	3,777,685	1,049,378	5,496,428	662,678	1,124,769	99,593	2,267,683	56,793	150,014	4,359,055	1,137,373	232,517	904,636	—240,668
Port Reading	21	129,230	.....	150,062	7,912	10,263	38	104,886	.....	1,517	124,508	25,554	10,000	15,554	235
Richmond, Fredricksburg & Potomac	88	185,612	135,512	372,771	29,643	38,592	4,228	128,885	3,113	9,048	213,508	159,263	11,525	147,708	33,323
Rutland	468	186,129	100,473	328,152	33,343	63,992	8,685	133,395	1,195	6,755	247,366	80,786	18,514	62,270	14,870
St. Joseph & Grant Island	258	137,493	25,253	174,096	36,582	22,789	4,712	60,348	485	4,968	129,883	44,212	8,830	35,279	13,769
St. Louis, Brownsville & Mexico	548	218,519	126,305	369,943	45,925	37,695	7,710	111,522	.....	10,413	211,399	158,543	8,000	150,538	129,371
St. Louis, Iron Mountain & Southern	3,539	2,539,265	682,501	3,506,555	440,715	486,743	72,238	1,015,153	10,377	67,144	2,090,627	1,415,928	146,390	1,267,380	575,495
St. Louis Merchants' Bridge Terminal	9	.....	623	239,915	39,559	16,133	1,030	126,137	.....	7,273	190,131	49,784	7,567	42,211	—13,312
St. Louis-San Francisco	4,752	3,034,663	1,079,831	4,502,210	568,628	903,085	65,524	1,451,003	.....	127,736	3,097,398	1,404,812	189,994	1,212,983	.....
St. Louis, San Francisco & Texas	244	65,305	28,097	103,956	20,279	19,782	1,626	46,459	.....	5,354	93,560	10,456	1,491	8,965	21,462
St. Louis Southwestern	943	771,764	148,223	966,382	62,150	132,992	34,857	213,357	2,405	29,855	475,508	490,875	34,069	456,743	233,273
St. Louis Southwestern of Texas	811	310,776	88,862	432,578	66,984	93,384	14,756	189,370	1,034	20,211	385,441	47,136	17,410	29,668	44,217
San Antonio & Aransas Pass	726	200,661	73,725	300,893	79,624	55,891	6,899	156,302	.....	14,331	311,717	—10,824	15,000	—25,826	8,918
Seaboard	3,461	1,738,473	594,499	2,569,166	252,714	396,531	86,910	917,622	19,851	65,029	1,735,115	834,051	102,489	730,892	123,772
Southern	6,983	4,543,170	1,618,885	6,764,151	868,993	981,322	167,026	2,250,162	46,324	187,510	4,455,439	2,308,712	281,993	2,024,136	475,737
Southern in Mississippi	281	61,723	36,579	106,849	26,397	8,072	2,172	49,586	.....	4,562	90,789	16,060	9,567	6,489	2,951
Southern Pacific	7,065	6,946,638	2,390,300	10,210,009	1,108,297	1,583,962	180,441	3,898,380	168,355	290,306	7,200,121	3,009,888	533,294	2,472,039	1,434,675
Spokane, Portland & Seattle	555	323,672	113,894	466,881	34,054	43,378	8,053	106,899	4,255	13,822	210,302	256,579	57,445	199,049	138,151
Tennessee Central	295	104,911	30,045	146,070	28,519	21,599	5,590	52,757	.....	6,670	115,135	30,935	4,800	26,134	17,144
Terminal R. R. Assn. of St. Louis	37	.....	421	275,153	29,385	19,046	1,096	92,529	.....	2,942	144,996	130,157	29,333	100,797	24,787
Texas & New Orleans	468	358,433	103,903	510,279	42,544	82,046	9,320	143,022	14,962	11,140	302,961	207,318	20,021	187,031	173,778
Texas & Pacific	1,944	1,291,609	432,815	1,856,926	202,732	174,169	39,853	806,320	11,701	60,896	1,290,650	566,276	80,000	485,841	125,251
Toledo & Ohio Central	436	436,219	53,583	513,769	67,900	120,594	7,558	221,263	1,759	10,205	429,279	84,490	25,959	58,507	4,719
Toledo, Peoria & Western	248	61,770	36,687	106,047	16,781	28,791	2,614	41,147	.....	4,580	93,904	12,143	7,500	4,643	8,596
Toledo, St. Louis & Western	451	464,690	32,457	521,306	81,431	91,351	20,720	184,329	.....	9,655	387,332	133,975	19,000	114,974	—28,905
Ulster & Delaware	129	23,921	12,241	51,943	6,201	8,974	1,164	29,128	365	3,522	49,355	2,588	4,000	—1,412	—7,077
Union Pacific	3,622	3,494,092	879,855	4,889,785	546,142	791,923	114,746	1,747,730	98,547	178,105	3,466,465	1,423,320	266,600	1,156,533	—388,702
Union R. R. of Baltimore	8	125,105	29,554	156,778	9,022	.....	.....	6,372	.....	2,246	17,631	139,147	7,453	131,694	13,868
Union R. R. of Pennsylvania	31	.....	.....	383,499	43,492	133,715	108	189,501	.....	5,889	372,705	10,794	7,000	3,794	—77,096
Vicksburg, Shreveport & Pacific	171	113,038	46,116	179,616	14,382	27,501	4,152	53,260	2,259	5,358	106,912	72,704	11,600	61,104	34,649
Virginian	513	748,092	36,751	823,965	64,478	127,434	6,011	221,343	13,148	17,097	448,351	375,614	34,000	341,611	39,605
Wabash	2,519	2,104,976	544,933	2,912,839	271,580	495,600	98,378	1,250,783	17,879	74,985	2,203,048	709,791	105,222	604,226	—183,235
Wabash-Pittsburg Terminal	63	80,259	8,711	96,725	16,132	19,339	1,786	37,015	2,363	4,391	81,027	15,698	7,546	8,151	—13,322
Washington Southern	36	63,739	77,941	187,877	12,658	24,070	1,681	60,941	1,385	4,125	104,860	83,017	4,825	78,192	24,512
West Jersey & Seashore	359	205,243	241,997	490,099	110,341	74,139	10,428	256,790	3,130	17,870	472,627	17,472	40,249	—22,785	4,406
Western Maryland	775	884,342	71,707	1,031,965	115,289	176,765	20,505	328,262	10,547	26,271	677,385	354,581	36,500	318,081	55,534
Western Pacific	958	465,993	75,098	585,372	67,725	75,388	19,944	197,726	10,256	19,205	390,245	195,128	32,274	162,852	85,398
Western Ry. of Alabama	133	67,155	46,592	125,076	15,666	24,663	6,495	37,704	2,142	4,369	91,040	34,036	6,064	27,965	6,466
Wheeling & Lake Erie	512	583,190	48,999	680,917	62,092	140,164	7,681	262,855	1,618	18,682	493,092	187,825	42,820	145,005	—52,836
Wichita Valley	257	69,160	19,963	113,330	22,531	6,385	93	26,013	.....	1,399	56,422	56,909	3,750	53,159	15,513
Yazoo & Mississippi Valley	1,382	1,037,219	301,759	1,425,769	203,111	233,135	21,624	457,491	2,464	35,188	949,101	476,667	64,650	411,472	94,677

Work on the Chicago Union Station Resumed

The differences between the Chicago Union Station Company and the building trade unions which had held up all work on the Union station since last July were settled on March 9, following a conference lasting three days. The demand that all railway labor in Cook county be unionized was waived. A contract was also entered into by which all future differences between the company and the unions will be settled by arbitration. On Monday 2,000 men returned to work on the Pennsylvania freight terminal, the steel frame work of which was well advanced when the strike was called last summer. An additional 800 men resumed work on the construction of new freight houses for the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St. Paul and the Chicago & Alton.

On the Despatcher's Phone

A correspondent in Indiana, describing what he says can be heard at almost any time on a train despatching wire, recites the following scraps of conversation:

"Number 91 meet number 92 at Lobster Junction meet number 82 and first number 86 at Bondstown instead of Chimbuctoo. '(In a loud voice): Hello despatcher! Let me talk to Brown at Rockford, please.' 'Well, wait until I finish this order, please.'

"(Second interruption): Despatcher! Number 92 has a drawbar pulled out on the curve just east of here. It will take 15 minutes to get the car put away. Any more for 'em?

"Yes, copy 31 in a minute."

Operator:—How is number 31 tonight?

Despatcher:—On time. OS number 30.

Operator:—OS—CS number 30 a 9:22 d 9:29; delayed with hot engine truck; said they might have to have another engine at Camptown.

Despatcher:—Hello Camptown! Tell the roundhouse foreman number 30 may need another engine; will be there about 18 minutes late; hot engine truck.

(Third interruption): Hello Despatcher! Can I talk to the superintendent a minute, please? Then follows a ten-minute conversation between the superintendent and the agent at Dinglebattle about some delayed loads. All this time the despatcher has to listen to the conversation. What will he do with number 30? How will he change his meeting points between number 30 and the opposing trains? And, says our correspondent, *Who wants to be a despatcher?*

The Bristol Derailment

The wreck of a freight train and an Adams Express train, killing four men, on February 25, near Bristol, Pa., reported in the *Railway Age Gazette*, March 2, page 371, is the subject of a report issued by the Pennsylvania Railroad in which it is declared that the circumstances furnish a practical demonstration of the truth of the contention that the "extra crew," or so-called "full crew," laws actually encourage indifference to duty. A journal was burnt off at the eleventh car from the locomotive of the freight train, derailing that car and ten others. An Adams Express train, about to pass on the adjoining track, in the opposite direction, ran into the derailed freight cars, with the result that the fireman and three attendants on the Adams Express train were killed. The freight train consisted of 33 cars and was manned in accordance with the terms of the "extra crew" laws (three brakemen).

The inquiry conducted by the general manager brought out that in the course of the run from Waverly, N. J., to Bristol, a distance of about 54 miles, the conductor, the flagman and the rear brakeman never left the caboose, except during two brief stops. On each of these occasions the conductor and rear brakeman claim to have walked beside the train a distance of about five car lengths from the rear. The head brakeman rode in the engine cab from Waverly to the point of the accident.

In the opinion of the officers of the company the accident would not have occurred if the crew had given proper attention to duty. The waste in the box was blazing brightly as the train passed through Trenton. It was observed by at least two employees in the yards there, and should easily have been apparent to the men in the caboose and in the engine had they kept watch forward and backward along their train. The accident occurred about 3 a. m. The waste must have begun to burn miles before Trenton was reached, and the smell would have been apparent to an attentive crew for some time before flames appeared.

"The management believes that the responsibility for the wreck rests with the entire crew of the freight train, with the exception of the fireman, indifference to duty being shown by all the other members, including the additional brakeman carried in conformity with the law. . . ."

Following the publication of the railroad's statement, representatives of the Brotherhood of Railroad Trainmen issued, at Harrisburg, a statement declaring that the Bristol case showed the need of the additional trainman. They say:

"The company, in its statement, says that the conductor, the flagman and the rear flagman were all riding in the caboose; that one of these men was an extra employee, being carried simply to comply with the provisions of the law. . . . The fact that the hot journal caused the wreck shows that there is need for a constant watchfulness.

"Why was the extra brakeman being carried in the caboose instead of being out on the train? The responsibility as far as concerns getting proper service from their employees rests with the railway company, and not with the full crew. The full-crew bill provides for a careful supervision of the entire operation of a train and the compliance with all the rules of the railroad. In this case, theoretically, the railroad company contends that fewer men would give greater supervision of a train; that one brakeman would have prevented the Bristol wreck, while two could not. . . .

"An effort to enforce the spirit as well as the letter of the law would compel all employees to discharge their full duty. . . ."

Truth About Full-Crew Laws

P. W. Garrett, investigating, on behalf of the New Jersey State Chamber of Commerce, various railroad accident records during the past few years, since the New Jersey and Pennsylvania "full-crew" laws went into effect, finds that the proportion of reported casualties which possibly may have been affected by the size of the train crew was 2.4 per cent. This small percentage, however, is, evidently, much too large; for to make sure of being fair to the advocates of these laws, the investigator includes all miscellaneous collisions and derailments and all coupling accidents which are reported as unexplained. Mr. Garrett says that he finds that there was a marked drop in the casualty lists in the New York State reports just following the enactment of the full-crew law. "There were 7,432 casualties during the year just preceding the operation of the law, (year ended June 30, 1913,) and 5,704 casualties during the year just subsequent, (year ended June 30, 1914). It would seem on its face that the law, enacted as a safety measure, had been effective in reducing the list by 1,728 casualties, or a part of them. It has been so contended by proponents of the law. But a close study of the 334 sub-classes in which that net reduction of 1,728 casualties appears shows that at least 1,696 could not conceivably have been reduced through the agency of the full-crew law."

Mr. Garrett seems to have made inquiries among trainmen and he reports that 79.7 per cent (55 of the total of 69 received) of the replies from engineers expressed confidentially that as individuals they were not in sympathy with the present law; that 47 per cent (31 of the total of 66) of the replies received from conductors expressed confidentially that as individuals they were not in sympathy with the law; and that all of the only three replies from organizations of trainmen were in sympathy with the law.

"The labor unions are favorable to the law. The railroads are all unqualifiedly opposed to the law. The public press is generally opposed to the law. The manufacturers are largely opposed to the law. * * *"

One Railroad Expense Capable of Reduction

The freight claim prevention division of the Missouri, Kansas & Texas Lines has addressed an appeal to stationmen, trainmen, yardmen, enginemen and carmen of the company, entitled "Saving Money." The opening paragraph states that the receiver desires to save $100,000 in the expenditures for loss and damage to freight during the present fiscal year. All other expenses are going up; this one can be made to go down. Among the specific examples of costly carelessness that can be prevented in the future, the following were cited: Recently a car was loaded with "native" cattle. It happened to have been previously loaded with

"Southern" cattle, and the "Southern" card had not been removed, indicating that the ear had not been cleaned. If the car had been properly inspected before permitting it to have been loaded, it would have saved the payment of a $150 claim.

Some time ago what purported to be the original order bills of lading covering shipments originating on one of the lines, were presented to the representative of one of the other lines, properly endorsed, with request for diversion. No exceptions were taken to the bills of lading or the endorsements thereon and the changes were made as requested. It afterwards developed that the bills of lading were forgeries, and the making of the diversions cost over $1,000.

A claim is just being paid for damage to shipment of asphaltic roofing paper. The freight house men loaded the rolls flat and the paper got hot and stuck together. Each roll is stamped "stand on end." It is necessary to load in this way, with proper bracing, in warm weather. If this shipment had been loaded properly, $30, or the extent of the damage, would have been saved.

Bangor & Aroostook Takes Public Into Confidence

The severest winter ever known in Maine recently brought the Bangor & Aroostook face to face with a coal famine. The rigorous weather conditions proved a heavy drain on the fuel supply of the road. Not only was an extraordinary amount of coal consumed in the movement of regular trains, but also by the operation of snowplows almost daily from December 1 to March 1 to keep the road open daily. The company has a five-year contract for West Virginia coal, but deliveries both by rail and by water have been delayed by freight congestion in the eastern states and unfavorable weather on the ocean. The situation became so alarming that President Percy R. Todd decided to take the public into his confidence and solicit its co-operation. He therefore published an advertisement in the newspapers on February 20, in which he explained the reason for the shortage of coal, and asked that shippers help him through the crisis. He stated that on that date the company had less than a week's supply of coal on hand, although it had bought as much free coal as possible, regardless of price. He said in part: "It may be necessary temporarily to take off some passenger trains, and therefore it is absolutely necessary to restrict the movement of freight; and shippers of southbound freight, particularly hay, paper, lumber, pulpwood and other forest products, are urged greatly to reduce their shipments during the next few weeks, as, if this is not done it may be impossible to move any traffic or to run any passenger trains."

A curtailment of train operation on the Bangor & Aroostook would prove serious for Boston, New York and other cities in the East, which have been depending largely upon Maine for their potato supply this winter. The potato shipments over the B. & A. this season have amounted to 14,544 carloads, containing nearly 10,000,000 bu.

A Sincere Puff

The Bulletin of the Traffic Department of the Southern Pacific reprints from the New Orleans Picayune a commendatory notice concerning an excursion of New Orleans people over the company's line, from which we take the following:

"By invitation, two hundred of the leading and most enterprising citizens of New Orleans betook themselves last Saturday to Algiers, to participate in a trip to ———. At one o'clock the cars, 'a luxury and a comfort' and 'superior to anything of the kind that had been seen in this section of the country,' were filled with guests. The locomotive, a new and splendid engine, being placed in motion, the train started, with banners and music, along the banks of the river. On it went through a low, miry region, and then emerged into view of many fine plantations on the banks of the river, and so passed rapidly and smoothly to the first stop, seventeen miles from Algiers. The editor had never passed over a smoother or pleasanter road. Conversation was uninterrupted, reading was quite easy, surrounding objects stood out clearly and distinctly to the eye, and altogether the ride was such as to remove all objections to that mode of locomotion. Everybody seemed joyous and amiable, feelings which were greatly increased by a view of the immense results which well-directed enterprise can achieve. . . . The miry, uncertain character of the soil and the constant exposure of overflow make difficult the making a foundation for a rail track in this region. The work executed is exceedingly firm and substantial. The cross-ties are laid about eighteen inches apart. The gage of the road is five and a half feet, being, next to the great Erie railroad, the widest in the Union. After viewing the road and the surrounding country, the party was invited to partake of a handsome collation, spread on tables laid out on a pleasant little knoll near the stopping place. The bracing air had given the gentlemen present a good sharp appetite, and full justice was done to the comestibles and potables. About this time the whistle began to raise its notes, and the party rushed from the tables and tumbled into the luxurious cars in a very hilarious mood. And now the iron horse began to snort and champ his bit and hold his breath, but the engineer held him in, until suddenly, at the tap of the drum, he sprang forward as never charger of flesh and blood did before; full rein was given him, and away he went, rushing past the wind, and making the old Mississippi look dreary. . . . It was the fastest race we ever made, or witnessed, seventeen miles in twenty-four minutes. That is time for you!"—This was in December, 1853.

Great Increases in the Cost of Materials

N. M. Rice, second vice-president of the St. Louis-San Francisco, recently prepared a table showing that 52 per cent of the materials purchased by the Frisco in 1915 will cost $3,350,532 more in 1917, or an increase of 119 per cent. The remaining 48 per cent of material purchased has increased 60 per cent in price. Such items as axles bought in the same quantity as in 1915, would cost 257 per cent more in 1917. High speed drills bought for $13,999 in 1915, will cost $61,594 in 1917, or an increase of 340 per cent. Fabricated car material has increased 212 per cent, boiler tubes 201 per cent, steel wheels 107 per cent and cast steel bolsters 103 per cent. In the maintenance of way field such items as track bolts, if bought in the same quantities in 1917 as in 1915, would cost 185.7 per cent more. Gasoline will cost 172.6 per cent more. Continuous joints, if purchased in the same amount as in 1915, will require an additional expenditure of $152,432 or an increase of 60.3 per cent. Additional expenditures for track spikes will amount to $209,714 more than in 1915 or an increase of 183 per cent. Cast iron pipe would cost 200 per cent more, tie plates 145.3 per cent and common nails 85 per cent more. The same quantity of spring frogs, if purchased in 1917, would cost 47.4 more than what they cost in 1915, while the additional expenditures for the same quantity of switches would amount to $34,779, or an increase of 46.1 per cent.

The Nashville, Chattanooga & St. Louis similarly reports great increases in the cost of materials. Carriage bolts have advanced 200 per cent over the price of 1915, steel billets have advanced 220 per cent, tank plates 223 per cent, steel bars 190 per cent, rivets 155 per cent, tie plates over 100 per cent, cattle guards 72 per cent, blue print 122 per cent and cotton waste 67 per cent. The cost of steel coaches in 1915 was about $12,000, today these coaches cost $18,000. A year ago the N. C. & St. L. purchased Mikado locomotives at $19,000 each, today they cost $37,000 for November delivery. The cost of freight cars has advanced 50 per cent while car axles have advanced 225 per cent. During the recent coal famine the roads paid as high as $5 and in some instances $7 per ton for coal to operate its trains. In addition there has been a considerable advance in the cost of labor within the past six months. The payroll for track laborers has increased $75,000 and something over a five per cent increase has been given the station forces while increases have been made to shop forces and the entire clerical forces over the system have been given advances averaging five per cent. The roads' reports for operations for January just issued show that operating expenses were over $100,000 above operating expenses for January, 1916.

American Railway Engineering Association Annual Dinner

The annual dinner of the American Railway Engineering Association will be held in the Gold room of the Congress hotel, Chicago, on Wednesday evening, March 21. The speakers at the dinner will be A. P. Thom, general counsel Southern Railway, on "The Relations of the Government to Rail Transportation"; Samuel O. Dunn, editor, *Railway Age Gazette*, on "The Interest of Private Property in Railway Regulation"; Sir William Peterson, principal of McGill University, Montreal, Quebec, on "Sister Democracies," and Professor William H. Thornton, of the University of Virginia, University, Va., on "The Basis of Professional Ethics for Engineers."

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AIR BRAKE ASSOCIATION.—F. M. Nellis, Room 3014, 165 Broadway, New York City. Next annual convention, May 1-4, 1917, Hotel Chisca, Memphis, Tenn.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 20-22, 1917, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Next meeting, June 13-20, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. Next convention, May 22-25, Cincinnati, Ohio.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—E. R. Woodson, Rooms 1116-8 Woodward Bldg., Washington, D. C. Annual meeting, May 30, 1917, Hotel Jefferson, Richmond, Va.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—Willis H. Failing, Terminal Station, Central of New Jersey, Jersey City, N. J. Next meeting, May, 1917, Cincinnati, Ohio.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual dinner, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

CINCINNATI RAILWAY CLUB.—H. Boutet, Chief Interchange Inspector, Cin'ti Rys., 101 Carew Bldg., Cincinnati. Regular meetings, 2d Tuesday, February, May, September and November, Hotel Sinton, Cincinnati.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. G. Crawford, C. B. & Q. R. R., 702 E. 51st St., Chicago. Next meeting, May 14-17, Hotel Sherman, Chicago.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 22-25, Hotel Jefferson, Richmond, Va.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Next meeting, June 13-20, Atlantic City, N. J.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, 349 Peoples Gas Bldg., Chicago. Next convention, March 19-22, 1917, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—Geo. A. J. Hochgiebe, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—F. C. Stewart, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August. Pittsburgh Commercial Club Rooms, Colonial-Annex Hotel, Pittsburgh.

RAILWAY DEVELOPMENT ASSOCIATION.—D. C. Welty, Commissioner of Agriculture, St. L., Iron Mt. & So., 1047 Railway Exchange Bldg., St. Louis. Annual meeting, May 9-11, Louisville, Ky.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Myers Bldg., Bethlehem, Pa. Next meeting, March, 1917, Auditorium Hotel, Chicago.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, N. Y. C. R. R., Box C, Collinwood, Ohio. Annual convention, May 21-23, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 2136 Oliver Bldg., Pittsburgh, Pa. Meetings with Master Car Builders' and Master Mechanics' Association.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grand Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 a. m., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Ag't, Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings bi-monthly, Pittsburgh.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific. Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Monday in month, except June, July and August, Hotel Sherman, Chicago.

WESTERN SOCIETY OF ENGINEERS.—E. N. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

Colonists' rates to the West have been discontinued this year. Traffic officers have come to the conclusion that there is no longer a necessity for one-way rates for people moving to the West. In recent years these low-rate tickets have been used largely by commercial travelers and others for whom the rates were not intended. Colonist fares had been in vogue for about twenty years.

The steamship Minnesota, which was built by the Great Northern Railway in 1904, and which has been in service on the Pacific Ocean, arrived in New York City last week with a cargo of California products, including 18,000 barrels of wine. The vessel has been sold to the Atlantic Transport Line, to be run between New York and London. The Minnesota is 622 ft. long and 73 ft. beam. She is the largest American freight vessel, which has passed through the Panama Canal. The Dakota, sister ship of the Minnesota, was destroyed some years ago on the coast of Japan.

The Southern Railway, following the revision of its operating organization, has established joint yard operation at a number of points where separate yards previously were maintained by lines now included in the system; and at Chattanooga, Tenn.; Birmingham, Ala.; Meridian, Miss.; New Orleans, La., and Oakdale (Harriman Junction), Tenn., from two to three hours will be saved on every through freight train. The saving in time is effected through the elimination of double handling and inspection, which was necessary when each train had to move through two yards.

Considerable economy was effected by the lines in Western Passenger Association territory in the printing and distribution of time table folders in 1916. Distribution of folders in hotels was discontinued in W. P. A. territory, except at border points, with other associations, such as Chicago, St. Louis and Kansas City. In these cities and in the larger cities of other passenger association territories, the distribution of folders to the less important hotels was stopped. In western territory, 569 locations where folder racks were maintained were discontinued, and in eastern territory 192 locations in hotels and principal cities were discontinued. Beginning with this year, subscriptions to a large number of minor folder distributing companies in the Central Passenger Association territory were canceled. The W. P. A. railroads are now considering cutting off the distribution of folders in all hotels in cities east of Chicago, St. Louis, Memphis and New Orleans, with the exception of a relatively small number of important houses in the larger cities already agreed upon. The association recommends that at border points the distribution of folders in hotels and other places outside of ticket offices shall be a matter of conference and mutual agreement, and that in interior points in any association territory, the home association shall prescribe all locations other than railroad ticket offices.

War, Gold and the Crops Are the Real Causes of the Food Crises and High Prices

In an interview given out in Chicago a few days ago J. W. Higgins, chairman of the General Managers' Association of Chicago, attributed the present high prices in this country to the operation of economic laws. Our products of agriculture, mines and factories have been exchanged with European countries—not for like products—but for gold. Partial crop failures further reduced food products. Undoubtedly, the realization on the part of many of actual conditions has caused increased purchases against possible future higher prices. I do not believe there is any food famine or danger of food famine in this country. There is plenty of food for man and best, and the railroads are able to move anything and everything for the needs of the people. This was demonstrated in the handling of fuel for the larger centers this winter, supplying an extraordinary demand for coal under extremely adverse conditions, as a result of no condition that they could control, but an oversight on the part of consumers in not preparing in advance for

an adequate partial supply at a time when both the mines and the railroads could have supplied it with ease.

Car shortage is not now, and never has been, nation-wide. Many railroads have equipment in excess of their ownership, as shown by Interstate Commerce Commission reports. The tying up of freight cars under load is caused by the shortage of ocean-going vessels. The railroads have had no recent increase in rates; they are transporting these higher priced commodities at the same rates that were in effect when the goods were worth much less.

Lumber Conference Committee at Norfolk

The Pennsylvania Railroad announces the establishment of a special Lumber Conference Committee at Norfolk, Va., in which the principal railroads south of Washington, in co-operation with the Pennsylvania, will carry on a clearing house to deal with applications for special modifications of the embargoes against domestic lumber and forest product shipments to eastern and northern points, which the eastern railroads were compelled to place last January, on account of the general congestion and car shortage. There is a heavy demand for lumber, occasioned by the unusually large spring building operations and the general need of manufacturers, and the embargoes will be modified wherever practicable. Every possible effort will be made to expedite the movement of lumber, but progress will of necessity be slow, for several thousand carloads of lumber are awaiting loading in the South for northern and eastern destinations. The chairman of the committee is John T. Wray.

C. F. A. Class Rate Hearings

The hearing at Chicago on the proposed class freight rates in Central Freight Association territory continued throughout last week and is still in session before W. J. Disque, examiner of the Interstate Commerce Commission. Early last week H. C. Covertson, traveling officer of the Cleveland, Cincinnati Chicago & St. Louis (erroneously called D. J. Mullen in our issue of last week), was on the stand for the purpose of showing the terminal costs of handling l. c. l. freight. H. G. Wilson, of Toledo, representing the shippers, objected that one of Mr. Covertson's exhibits did not include class shipments moving under the 25-cent minimum charge, and he wanted to know how in figuring costs the time of men who handled those shipments had been separated from the time given to larger shipments. Mr. Covertson replied that less than six per cent of the l. c. l. freight moved under the minimum charge and that the exhibit only included shipments moving under class rates above that charge. He introduced exhibits to show the average haul and average revenue per ton on the bases of the present and the proposed rates, and the direct terminal cost per ton based on average expenses at Indianapolis, Ind., Cleveland, Ohio, Columbus and Dayton, to 42 representative points in Indiana and Ohio, covering l. c. l. freight moving under class rates in May, 1916. He stated that the present revenue was $2.47 per ton, and that the proposed revenue would amount to $3 per ton. The direct terminal cost per ton was $1.60, whereas the revenue needed to produce an operating ratio of 66.07 per cent on direct terminal costs amounted to $2.40. The average haul of l. c. l. freight was 50.52 miles.

A large part of the week was devoted to the cross examination of W. C. Maxwell, vice-president in charge of traffic of the Wabash, who was one of the first to testify in the case. Mr. Maxwell read a resolution showing the intention of the railroads to file tariffs within 20 days to meet the objection raised by H. C. Barlow, of the Chicago Association of Commerce, that under the proposed scale ports on the western shore of Lake Michigan would receive an advance in rates in C. F. A. territory without any being made to the Twin Cities or interior Wisconsin points. In reply to a series of questions intended to show that the density of traffic was a factor in the cost of service, Mr. Maxwell stated that the cost of handling l. c. l. freight was great whether there was much or little of it, and for that reason the roads have not made an exhaustive study of the division of traffic with reference to commodity and class rate movements. In answer to a charge by Mr. Wilson that the railroads had not introduced statistics showing the division of revenue or costs among the various classes of traffic, Mr. Maxwell stated that the judgment of the carriers from actual knowledge of conditions was that fifth and sixth classes bore a larger relative burden of costs than the other classes, and for that reason the greatest advances were asked in the first, second and third classes. In the course of the testimony Mr. Maxwell declared that the shippers instead of opposing the proposed increases should aid the railroads in obtaining them. He stated that the carriers had simply broken down under the traffic offered because of inadequate equipment and terminal facilities which insufficient revenues prevented them from providing. After Mr. Maxwell left the stand C. S. Sikes, general auditor of the Pere Marquette, was cross examined.

The shippers started their case late in the week. Frank E. Williamson, traffic commissioner of the Buffalo Chamber of Commerce, was the first to testify and complained that under the new adjustment the class rates to Buffalo had been increased, whereas rates to Syracuse and Rochester remained the same, thereby disturbing the relationship between these cities, to the disadvantage of Buffalo. C. O. Moore, traffic manager of the Pittsburgh Chamber of Commerce, had a similar complaint to make with reference to rates from C. F. A. territory to Pittsburgh, which were increased, and to Altoona and Harrisburg, which remained the same. C. E. Childe, traffic commissioner of the Sioux City Commercial Club and spokesman for all the Missouri river cities, protested against the raising of rates to those cities while the rates to the Twin Cities remained the same. He stated that the Missouri river cities competed in common territory with the Twin Cities and were put at a disadvantage. Attorneys for the railroads called his attention to the fact that the railroads had expressed their intention of filing additional tariffs to readjust the rates to St. Paul and Minneapolis.

Freight Car Situation in West Continues to Improve

With continued fair weather and the gradual lifting of eastern embargoes the congestion of western lines with eastbound cars is steadily disappearing. The Chicago, Burlington & Quincy has reduced the number of embargoed cars on its lines to about 200. Other western roads have reduced the number on their rails from one-half to two-thirds or more. Despite the fact that it was hampered by a shortage of cars and an unprecedented condition in the terminals during the first two months of the year, the Chicago & North Western reports that up to March 1 it loaded 967 more cars than in the previous year. There was somewhat of a falling off in the loading of stock and lumber, but an increase of 800 cars in the loading of grain. The Atchison, Topeka & Santa Fe also reports an unusually heavy business, especially westbound.

The new car service rules, requiring the prompt return of foreign cars to owning lines, has so far proved a hardship on western lines. The Illinois Central reports that although it had fewer cars on its lines than it owned when the new rules were put into effect it has been delivering an average of 200 cars more per day to foreign lines than it has received in its own equipment from other roads. Other companies report a similar condition and explain it on the assumption that a large proportion of their cars had reached such remote parts of the country that it is taking much time for the cars to be moved home. Other roads complain that the different lines of the country are not placing a uniform construction on the new rules. Quite a number of differences have risen between the railroads, such as the responsibility for damage claims. There is considerable difference of opinion as to the efficacy of the new rules. Some railway officers believe that after the period of readjustment has passed there will be a general improvement in the car situation, with more cars where they are needed and fewer where the worst congestion has been experienced. Others complain that the new rules limit the movement of cars to certain directions and thereby result in an actual decrease in the amount of equipment available for loading.

J. P. Griffin, president of the Chicago Board of Trade, and six other members of the board, left Chicago for Washington on March 11, for the purpose of seeking relief from an alleged shortage of cars for grain loading at Chicago. Mr. Griffin declares that despite repeated telegrams and letters to the Interstate Commerce Commission by members of the Board of Trade, there had been no appreciable improvement in the deliveries of empty cars for loading. Members of the Board of Trade declare that munitions firms and cement manufacturers find no trouble in getting cars in the East, but when grain cars are requested at Chicago nothing but unproductive promises are forthcoming.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The commission has suspended until July 8 tariffs providing for increases in rates on grain and grain products from St. Louis, Mo.; Cairo, Ill., and other points to various destinations in Arkansas on the Chicago, Rock Island & Pacific.

The Interstate Commerce Commission has further suspended to November 10 tariffs providing for the concellation of existing commodity rates on iron and steel articles in carloads between Chicago and related points and various points in western trunk line territory.

The commission has amended the fourth paragraph of Conference Ruling 354, and made it unlawful for a carrier to issue through bills of lading under an arrangement with a water or other carrier for a continuous carriage until such water or other carrier shall have lawfully filed with the commission rates applicable to such carriage.

The commission has suspended until July 13 the tariffs filed by numerous railways proposing uniform increased charges for reconsignment and diversion of freight en route, providing a charge of $2 a car if reconsigned in transit prior to arrival, and $5 if after arrival at original destination. These increases were objected to by shippers at the hearing held last week.

The commission, having rendered its report in the case involving fourth section violations in the southeast, and now having before it for consideration complaints with respect to the readjustment of rates to the southeast made in pursuance of its orders, has decided to enter upon an investigation on its own motion concerning the class and commodity rates established on January 1, 1916, and thereafter amended and supplemented, from eastern cities and interior eastern points, Virginia cities, Buffalo-Pittsburgh territory, Ohio or Mississippi river crossings, south Atlantic ports and Gulf ports to points in southeastern territory, in order to determine whether or not such rates are reasonable and free from unjust discrimination, and are properly related. Dates for hearings will be announced later.

Fruit Refrigeration

Opinion by Commissioner Harlan:

Proposed increased refrigeration charges from points in Idaho, Oregon, Montana, and Utah to points in other states are found not justified, the record being held not sufficiently clear. (43 I. C. C., 102.)

Boston-New York Proportional Rates

Opinion by Commissioner Clements:

A proposed cancellation of proportional rates between New York and points in southeastern New England applicable on traffic handled south of New York by coastwise steamship lines is found not justified. (43 I. C. C., 203.)

Scranton-Williamsport Rail and Lake Rates

Opinion by Commissioner Clark:

Proposed increased rail-and-lake and rail-lake-and-rail class and commodity rates from the Scranton, Williamsport and Northumberland groups in Pennsylvania to Lake Michigan and Lake Superior ports and to St. Paul and Minneapolis, Minn., and other points, are found not justified. (43 I. C. C., 182.)

Gasoline from Coffeyville, Kan.

Opinion by Commissioner Meyer:

The commission finds not justified proposed increased rates on gasoline in carloads via two lines and on petroleum and petroleum products via a third line from Coffeyville, Kan., to Kansas City and Sugar Creek, Mo., and on petroleum and petroleum products via all lines from Coffeyville to Omaha and South Omaha, Nebr., and Council Bluffs, Iowa, applicable on shipments originating at Delaware, Okla. (43 I. C. C., 98.)

Rates on Rice

Southern Rice Growers' Association et al. v. Texas & New Orleans et al. Opinion by Commissioner Hall:

Upon application of complainants to require the defendant carriers to re-establish milling in transit on rice from all rice-producing points in Texas, and in Louisiana west of the Mississippi river, to interstate destinations on the lines of the defendants, the commission holds that the defendant carriers have not justified the withdrawal of milling-in-transit arrangements on rice which were maintained by them during the period from December, 1912, to September 1, 1914, and that such arrangement should be restored, and that the two-cent milling-in-transit charge on the clean rice which applied during the period when transit arrangements were in effect has not been shown to be unreasonable. (43 I. C. C., 90.)

Molasses from Texas and Louisiana

Opinion by Commissioner Clements:

The carriers have justified a proposed increased carload rate on domestic molasses from New Orleans, and points taking the same rates to Texarkana, and points taking the same rates, and proposed increased carload rate on molasses from Monroe, La., to Texarkana, justified.

They have not justified a proposed increased carload rate on domestic molasses from points on the line of the Texas & Pacific Westwego Elevators to New Orleans, inclusive, to points Boyd, Ark., to Kiblah, Ark., inclusive, or a proposed change in tariff rule whereby the amount of molasses included with sugar or honey in a mixed carload shipment may not exceed one-third of the total weight of the shipment. (43 I. C. C., 85).

Peddler Car Minimum

Opinion by Commissioner Hall:

Proposed changes in the rules governing shipments of packing-house products, fresh meats and other articles transported in peddler cars in central freight association territory are found not to have been justified. The present rule is as follows:

> The minimum aggregate charge per car to be on basis of minimum weight of 20,000 pounds at the dressed beef carload rate, as per tariffs lawfully on file with the Interstate Commerce Commission, as to interstate traffic and with other railroad commissions as to traffic subject to their jurisdiction to the furthermost destination of any consignment in the car. In case the charges on the several consignments as to respective destinations at the less-than-carload rates do not aggregate the above minimum, the difference to make the required minimum charge must be added.

The respondents proposed to substitute 21,000 for 20,000 lb. (43 I. C. C., 139.)

Commission Proposes Conditional Changes in Transcontinental Freight Rates

The commission on Wednesday made public a report of Examiner Thurtell making tentative recommendations in the transcontinental rate case; and it has been served on the parties as a basis for argument. Existing water competition is found to be a negligible factor as affecting rates by rail between Atlantic and Pacific coast terminals. Rates on commodities from eastern defined territory to the Pacific coast which are lower than rates on like traffic to intermediate points are found not justified under existing circumstances. Present rates on certain commodities from all eastern defined territories to the Pacific coast are found not unreasonably low and not to have been induced by water competition. The present rates on other commodities in schedules B and C are found as a whole unreasonably low, from territories east of the Missouri river to Pacific coast terminals. The present rates on the same commodities from Missouri river to Pacific coast are found not unreasonably low. Rates from eastern defined territories to all points west of the Missouri river should now be so adjusted that upon a return of water competition, which may necessitate reductions in rates to the Pacific coast, the rates to intermediate points, except points to which rates may be affected by combination on the coast rates, need not be disturbed. Suggestions are made to carriers for adjustment of those rates which are required to be changed, and if rates to intermediate territory are revised, in accordance with these suggested bases, when water competition, in the judgment of the carriers, makes necessary certain reductions to or from the Pacific Coast, the commission will, upon presentation of proper proof of competitive necessity,

consider the reduction of such rates without disturbing the rates to or from any intermediate points, except those to which the rates are affected by combinations on the coast rates.

Rates from Memphis to Points in Arkansas

City of Memphis et al. v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Daniels:

Following the commission's original report in this case, 39 I. C. C., 256, an order is entered: Prescribing a reasonable distance scale of maximum class rates and points in Arkansas on and east of the main line of the St. Louis, Iron Mountain & Southern extending from Texarkana, Ark., through Little Rock, northeasterly toward St. Louis, and to points on the St. Louis, Iron Mountain & Southern west of Little Rock on its line to Fort Smith, to and including Conway, Ark., and west from Newport, Ark., on the White River division, to and including Batesville, Ark. Requiring the carriers to remove the discrimination against Memphis due to the present relationship of class rates between Memphis and points in Arkansas above noted, and class rates between points in Arkansas described above, and requiring the carriers to remove the discrimination found to exist against Memphis due to the present relationship of class rates between Memphis and points in northeastern Arkansas and class rates between St. Louis, Mo., and East St. Louis, Ill., and these same Arkansas points. Fourth section relief is granted to carriers having indirect routes. (43 I. C. C., 121.)

STATE COMMISSIONS

The Utah legislature has passed a bill providing for the creation of a public utilities commission. The bill originally contained riders fixing an arbitrary schedule of coal freight rates and limiting the length of freight trains. Through the efforts of H. U. Mudge, president of the Denver & Rio Grande, and other railroad officers, who appeared at the hearings on the bill, these objectionable features were eliminated before its passage.

The Texas Railroad Commission has canceled its order of August 28, 1916, which canceled a previous order allowing the railroads to advance intrastate rates in Texas by approximately 10 per cent. The order was issued by the commission at the request of the attorney general of the state and representatives of the shipping interests, on the ground that it would facilitate the trial of the injunction proceedings against the commission now pending in the Federal Court and set for hearing at Fort Worth in April. When the railroads announced that they proposed to advance rates in Texas to comply with the order of the Interstate Commerce Commission in the Shreveport case, the Texas commission canceled its order allowing advances in the state rates, and the railroads secured an injunction against the enforcement of the order. As the higher rates carried in the tariff filed with the Interstate Commerce Commission are now in effect, it was represented to the commission that the circular of August 28 merely complicates the issues.

COURT NEWS

Taxes on Income from Leased Road

The Pennsylvania Supreme Court holds that a lessee of railroad property, agreeing to pay taxes and charges levied during the term under any existing or future law, was not bound to pay the income tax subsequently imposed on the lessor's rental, and the lessor, having paid it, could not recover it from the lessee.—Catawissa R. Co. v. P. & R. (Pa.), 99 Att., 807.

Actions Against Intermediate Carriers

The rule laid down by the Supreme Court of the United States, and now generally followed throughout the several states in construing the Carmack amendment, is stated by the Kentucky Court of Appeals to be that a shipper has a complete remedy against the initial carrier for all loss or damage sustained, the initial carrier being entitled to recoup itself for any part of the loss occurring on the line of one of the connecting carrriers. Or, the shipper may have his remedy against an intermediate carrier for loss which occurred on its line only, but not for any loss occurring otherwise, and in such a case the burden is on the shipper to show, not only the damage, but that it occurred on the defendant's line and not on one of its connecting lines; and his recovery will be limited to such loss or damage as he thereby sustained.—Southern v. Avey (Ky.), 191 S. W., 460.

Machinery and Appliances

In an action under the federal employers' liability act by a fireman on a yard engine engaged in interstate commerce injured by tripping over a drawbar pin beneath the tender which had worked up through the floor, no omission of inspection was shown and the defendant railroad did not know of the defect until a short time before the accident. The Washington Supreme Court held that the principle of *res ipsa loquitur* did not apply, and the plaintiff had failed to establish a *prima facie* case of negligence.—Toler v. Northern Pacific (Wash.), 162 Pac., 538.

Waiver of Notice of Claim for Injuries to Live Stock

The Mississippi Supreme Court holds that the benefit of the provision in a bill of lading requiring notice in writing of a claim for damages to live stock within a specified time can be waived by the station agent. Under such a bill of lading, it is held that where the shipper immediately on arrival of the stock observed injury, called the station agent, who, on the expense bill, noted that some of the animals were dead, some in bad condition, and the balance bruised and in bad shape, the requirement of written notice of claim was waived, and the shipper could recover.—New Orleans & N. E. v. Wodd (Miss.), 73 So., 615.

The Kentucky Court of Appeals holds that the agent of a delivering carrier in an interstate shipment of cattle was the agent of the initial carrier for purposes of delivery, and had authority to waive notice of injury required by the bill of lading issued by the initial carrier, and such waiver would excuse failure to give notice.—Baltimore & Ohio v. Leach (Ky.), 191 S. W., 310.

Elimination of Grade Crossings—Distribution of Cost of Bridge

In proceedings to eliminate grade crossings in the city of Worcester, Massachusetts, exceptions were taken by the commonwealth and the New York, New Haven & Hartford to the report of the auditor as to the construction of a bridge over Green street by the Boston & Albany. It was contended that the bridge built was not the kind of bridge the commissioners for elimination of grade crossings had authorized and that its cost was excessive. The Supreme Judicial Court of Massachusetts holds that the commissioners, having merely provided that the bridge should be a "masonry arch bridge," the Boston & Albany, as against those required to contribute to its cost, had the burden, not of showing that the cost was reasonable, but merely that it acted in good faith in the exercise of the discretion vested in it. Being charged with a discretion involving the safety of the traveling public, its duty to protect the interests of the parties who were to contribute to it became almost negligible. The decree required the tracks to be reconstructed with suitable ballast. It was held that it could not be said that crushed stone was not suitable ballast, and therefore it would not be limited to the cost of gravel ballast in the contribution by others to the cost. The removal of telegraph poles and wires, being incident to the work required of the Boston & Albany by the grade crossing elimination decree, for which it had to pay, it was held it could have contribution therefor.—City of Worcester v. Boston & Albany (Mass.), 114 N. E., 814.

UNITED STATES SUPREME COURT

Question What Is Carriers' or Private Track

In the action by the Hocking Valley against Swift & Company, decided by the Supreme Court of the United States on March 6, last, the court did not find it necessary to decide whether the ruling of the Ohio Supreme Court (93 Ohio St. 143) was correct, that private cars in railroad service on private tracks are subject to demurrage. Swift & Company had defended on the single ground that its cars were private cars standing on its private track, and contended that the demurrage rule requiring payment of demurrage under such circumstances was an arbitrary imposition, and unlawful and void. The United States Supreme Court holds that the track in question was *not* a "private track."

Under its agreement with or "License" from the railroad Swift & Company occupied a part of the railroad's premises for its warehouse and office. The "License" recites, among other things, the Licensee's desire "to occupy a tract of ground be-

longing to the railway company . . . for the purpose of maintaining thereon a warehouse and office . . . in such a manner as not in any way to interfere with the . . . tracks of the railway company . . ."; that the premises lie on "the north side of the railway company's siding, known as the Bank Track . . ."; that "the switch of the railway company hereby let and connected with its main line, shall at all times be under control of the railway company"; and that "the railway company shall have the right at all times to enter upon the premises hereby let for the purpose of repairing or maintaining the track thereon, or switching or removing cars thereover." A rental of $30 per annum was provided for; but the license was terminable on 30 days' notice.

Swift & Company's cars, placed on the track used in connection with the warehouse, were not unloaded within the 48 hours' free time allowed by the tariff. The court held that the cars were, though privately owned, still in railroad service while under lading. While on the "switch" they were on track owned by the railroad. The "transportation," within the meaning of the act to regulate commerce, was not ended.

"Doing Business" Within a State

A brakeman employed in a New Jersey freight yard of the Philadelphia & Reading brought an action in a New York federal court against the railroad for injury. The summons was served on the defendant's president while he was passing through New York engaged exclusively on personal matters unconnected with the company's affairs.

The cause was remanded by the Supreme Court of the United States with directions to dismiss it for want of jurisdiction, as shown by the following established facts. No part of the Philadelphia & Reading's railroad is situated within the state of New York. It has no dock, or freight or ticket office, or any other office or any agent, or property therein. Carriage within that state is performed solely by its connecting carriers. At various points in the Central Railroad of New Jersey's ferry terminal in New York City are signs bearing the name, "Philadelphia & Reading," and the name is inserted in the New York Telephone Directory. All this is designed to facilitate and encourage travel and for the convenience of the public. The Philadelphia & Reading did not direct the insertion of its name in the telephone book. The expense of that telephone service is paid by the Central of New Jersey. The fact, if established by competent evidence, that subsidiary companies of the defendant did business within the state would not warrant a finding that the defendant did business there.—Philadelphia & Reading v. McKibbin. Decided March 6, 1917.

"Engaged in Interstate Commerce"

The petition in an action under the Federal Employers' Liability Act alleged that the defendant operated its interstate commerce railroad between Chicago and Seattle and that for the purpose of shortening its main line and making more efficient and expeditious its freight and passenger service, was engaged in cutting a tunnel through the mountain between Horrick's Spur and Rockdale in Washington. It was averred that the plaintiff was employed by the defendant in the tunnel as a laborer and that while at work his pick struck a charge of dynamite which, through the defendant's negligence, had not been removed, and that from the explosion which followed he had sustained serious injuries. It was held that the plaintiff and the defendant were not engaged in interstate commerce at the time and no cause of action was alleged under the act.—Raymond v. Chicago, Milwaukee & St. Paul. Decided March 6, 1917.

One of the questions raised in the case of the New York Central v. White, under the New York Workmen's Compensation Act, decided by the Supreme Court of the United States, March 6, 1917, was whether the deceased was employed in interstate commerce at the time of his injuries. He was a night watchman, charged with the duty of guarding tools and materials intended to be used in the construction of a new station and new tracks on a line of interstate railroad. The commission found that he was on duty at the time, and at a place not outside of the limits prescribed for the performance of his duties and that he was not engaged in interstate commerce. The Supreme Court holds that this finding was correct, the deceased's work bearing no direct relation to interstate transportation.

Railway Officers

Executive, Financial, Legal and Accounting

P. H. Mulcahy, auditor, of the Ogden, Logan & Idaho, has also taken over the duties of auditor of freight and passenger receipts, succeeding J. S. Brereton, resigned. The office of auditor of freight and passenger receipts as a separate office has been abolished.

Operating

W. F. Booth has been appointed superintendent of the Chicago Short Line, with headquarters at South Chicago, Ill.

Edgar Hollenbeck, superintendent of the Houston & Brazos Valley, with office at Freeport, Tex., has resigned. It is not probable that a successor will be appointed.

H. T. Murray, acting assistant superintendent of the Chicago division of the Chicago, Burlington & Quincy, with office at Chicago, Ill., has been appointed assistant superintendent with the same headquarters.

W. G. Humphrey, assistant chief operating officer of the Missouri, Oklahoma & Gulf at Muskogee, Okla., has been appointed general superintendent, with office at Muskogee, in charge of the transportation, the maintenance of way and structures, and the maintenance of equipment departments.

H. E. Ruggles, trainmaster of the Chicago, Burlington & Quincy, with headquarters at Chicago, Ill., has been appointed passenger trainmaster in charge of passenger trains and suburban service between Chicago and Aurora, with the same headquarters as at present, succeeding F. P. Clark, assigned to other duties.

E. C. Lilley, superintendent of the St. Louis-San Francisco at Enid, Okla., has been appointed superintendent at Sapulpa, succeeding O. H. McCarty, resigned on account of ill health. A. W. MacElvaney, formerly superintendent of transportation, has been appointed superintendent at Enid, succeeding E. C. Lilley, promoted.

P. F. Kilker, chief train despatcher of the Delaware & Hudson at Carbondale, Pa., has been appointed assistant trainmaster, Pennsylvania division, vice E. G. Knapp, assigned to other duties; R. A. Seigle has been appointed chief train despatcher, vice Mr. Kilker, promoted, and J. J. O'Boyle has been appointed night chief train despatcher, vice Mr. Seigle, promoted.

Sidney S. Stone, whose appointment as superintendent of the New York division of the Lehigh Valley, with headquarters at Jersey City, N. J., has already been announced in these columns, was born at Hawley, Pa. He began railway work at the age of ten as a call boy on the Erie, at Hawley. Five years later he was appointed operator, and then served as agent and despatcher at various places. In 1900 he entered the service of the Delaware, Lackawanna & Western as a train despatcher. He subsequently served in various capacities on the same road, and then became a special agent on the staff of the general superintendent of the Lehigh Valley, from which position he is now promoted to superintendent of the New York division, as above noted.

Isaac T. Tyson, whose appointment as superintendent of the Philadelphia & Reading, with headquarters at Reading, Pa., has already been announced in these columns, was born on February 28, 1867, at Philadelphia, and was educated in the public schools. He began railway work on November 4, 1884, on the Philadelphia & Reading as assistant to the agent at Neshaminy Falls, Pa., and the following May became an extra operator. He then served consecutively as operator, extra agent and extra despatcher, and from July to November, 1889, as agent and despatcher on the Philadelphia & Seashore. In November, 1889, he was appointed yardmaster on the Philadelphia & Reading. The following April he was promoted to general yardmaster, remaining in that position until July, 1892, when he was appointed assistant trainmaster. From August, 1893, to August, 1899, he served as yardmaster and then as assistant trainmaster, until

his recent appointment as superintendent of the same road, as above noted.

I. E. Palmer, whose appointment as superintendent of the Chicago Great Western, with headquarters at St. Paul, Minn., was announced in these columns last week, was born at Independence, Iowa, on January 21, 1871. He first entered railway service with the Chicago, St. Paul & Kansas City, now the Chicago Great Western, as a telegraph operator and station agent in June, 1892, serving at various stations on the eastern division until April, 1906. He was then appointed assistant trainmaster, and in November of the same year became trainmaster, holding this office for 10 years. In February, 1916, he was appointed assistant superintendent, with headquarters at Chicago, Ill., which position he held at the time his appointment, as noted above, became effective. He succeeds J. W. Mulhern, assigned to other duties.

J. M. Woodman, who has been appointed superintendent of the Montreal Terminal division of the Canadian Pacific with headquarters at Outremont, Que., as has already been announced, was born on May 13, 1866, at St. Marys, Ont., and was educated in the public schools at Hamilton. He began railway work in April, 1885, as brakeman with the Northern & North Western, now a part of the Grand Trunk and left that company in January, 1888, to go to the Chicago & Alton, serving consecutively on that road as brakeman, conductor and yardmaster until January, 1895. He was then with the Terminal Railroad Association at East St. Louis, Ill., as yardmaster and general yardmaster. In May, 1903, he was appointed general yardmaster of the Wiggins Ferry Company, and in April, 1907, he left that company to become trainmaster of the Indiana Harbor Belt at Gibson, Ind. On January 1, 1912, he was appointed superintendent of terminals on the Canadian Pacific at Winnipeg, Man., and now becomes superintendent of the Montreal Terminal division of the same road as above noted.

Charles W. Brown, who has been appointed superintendent of the Lehigh & New England, with headquarters at South Bethlehem, Pa., as has already been announced in these columns, was born on January 10, 1880, at Fort Gaines, Ga. He began railway work in the engineering department of the Central of Georgia in September, 1898, and the following June was promoted to transitman on construction. From March, 1900, to August, 1904, he was transitman and resident engineer of the Baltimore & Ohio, and then to May, 1908, was assistant engineer and engineer of roadway on the Atlantic Coast Line. In 1908 and 1909 he was locating engineer on the Central of Georgia, and then for about two years was superintendent for the Hall, Parker Contracting Company. On August 15, 1911, he was appointed engineer maintenance of way of the Lehigh & New England, and in December, 1913, was promoted to assistant superintendent, which position he held at the time of his recent appointment as superintendent of the same road, as above noted.

Traffic

B. F. Coons has been appointed general agent, freight department of the Chicago, Rock Island & Pacific, with headquarters at Los Angeles, Cal.

F. E. Ellis, commercial agent of the Central of Georgia, at Atlanta, Ga., has been appointed division freight agent, with office at Atlanta, vice D. W. Appler, deceased.

W. D. Stark, traveling passenger agent of the Atlantic Coast Line at Jacksonville, Fla., has been appointed district passenger agent with headquarters at the same place.

V. M. Cluis, commercial agent of the Chicago, Rock Island & Pacific at Atlanta, Ga., has been appointed general agent of the freight department, with same headquarters.

John C. Clair, industrial and immigration commissioner of the Illinois Central, with office at Chicago, Ill., has been appointed general development agent, with the same headquarters. G. B. Harper, assistant industrial and immigration agent, has been appointed assistant general development agent, with the same headquarters. They will have charge of a newly created department, which will be known as the development bureau. Other officers coming under this department are Mark Fenton, industrial agent; H. J. Schwietert, agricultural agent; P. G. White, G. B. Wyllie and R. A. Plummer, immigration agents, with headquarters at Chicago.

George C. Devol, whose appointment as assistant general freight agent of the Louisville & Nashville, with headquarters at Louisville, Ky., has already been announced in these columns, was born on January 3, 1883, at New Albany, Ind. He was educated in the grade and high schools, and began railway work in October, 1898, in the freight claim department of the Louisville & Nashville. From 1901 to 1908 he served as a clerk in the general freight office, and then was appointed assistant chief clerk to the third vice-president and freight traffic manager. In February, 1912, he was appointed chief clerk to the general freight agent, and now becomes assistant general freight agent of the same road, as above noted.

B. H. Todd, district passenger agent of the Southern Railway System at Louisville, Ky., has been appointed division passenger agent, with office at the same place; H. C. King, city ticket agent at Lexington, has been appointed division passenger agent at the same place, and T. J. Connell, district passenger agent at St. Louis, Mo., has been appointed division passenger agent at the same place. G. M. Ellis, division passenger agent at Knoxville, Tenn., has been appointed district passenger agent, with office at Dallas, Tex.; Mitchell Coxwell, traveling passenger agent at Kansas City, Mo., has been appointed district passenger agent, at the same place, and R. H. Graham, traveling passenger agent at Minneapolis, Minn., has been appointed district passenger agent, with office at the same place.

Golder Shumate, whose appointment as assistant general freight agent of the Baltimore & Ohio, with headquarters at Baltimore, Md., has already been announced in these columns, was born on February 1, 1877. He began railway work in July, 1897, as a clerk in the general freight offices of the Baltimore & Ohio at Washington, D. C., resigning from that position in October of the following year. He returned to the services of the Baltimore & Ohio in April, 1899, and the following September became correspondent in the general freight department. In 1903 he was appointed rate clerk; two years later he was promoted to chief rate clerk, and in April, 1912, was appointed chief clerk in the general freight department at Baltimore, Md. On May 1, 1916, he was promoted to division freight agent at Youngstown, Ohio; the following December he was transferred in the same capacity to Baltimore, remaining in that position until his recent appointment as assistant general freight agent of the same road, as above noted.



G. Shumate

Engineering and Rolling Stock

S. E. Armstrong, supervisor of track of the New York Central at Richland, N. Y., has been appointed acting division engineer, with office at Oswego, N. Y.

J. E. McQuillen, mechanical superintendent of the Gulf, Colorado & Santa Fe, with office at Cleburne, Tex., has had his headquarters changed to Galveston.

S. A. Seely, supervisor of bridges and buildings of the New York Central, at Watertown, N. Y., has been appointed assistant engineer, with headquarters at Utica.

H. R. Pennington, traveling electrical inspector of the Chicago, Rock Island & Pacific, has been appointed supervisor of electrical equipment, with headquarters at Chicago, Ill.

N. F. Thompson, assistant district engineer of the New York Central at New York, has been appointed district engineer, with headquarters at Albany, vice E. B. Menuez, promoted.

Arthur W. McLean has been appointed general foreman of locomotives of the Chicago, Rock Island & Pacific, with office at Haileyville, Okla., succeeding Samuel Tolley, resigned.

R. C. Bardwell, chemist of the Missouri Pacific at Kansas City, has been promoted to assistant engineer in charge of water treatment of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo.

J. J. Karibo, master mechanic of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Mattoon, Ill., has been appointed master mechanic at Bellefontaine, Ohio, succeeding W. J. Frauendiener, resigned. E. J. Buckbee, master mechanic at Mt. Carmel, Ill., has been transferred to Mattoon, succeeding J. J. Karibo, transferred.

H. B. Reinsagen, principal assistant engineer of the New York Central lines west of Buffalo, at Cleveland, Ohio, has been appointed engineer maintenance of way, with headquarters at Cleveland; A. M. Currier, assistant engineer at Cleveland, has been appointed principal assistant engineer, vice Mr. Reinsagen, promoted, and the following have been appointed division engineers: S. C. Upson, Erie division, with headquarters at Erie, Pa.; P. E. Manchester, Cleveland division, with headquarters at Cleveland, Ohio; J. M. Podmore, Michigan division, with headquarters at Toledo, Ohio, and H. W. Fenno, Western division, with headquarters at Chicago, Ill.

Eugene Hicks Shipman, whose appointment as chief engineer of the Lehigh & New England, with headquarters at South Bethlehem, Pa., has already been announced in these columns, was born on March 17, 1863, at Clinton, N. J. He graduated from Lehigh University School of Civil Engineering in 1888. Previous to graduation he had served as a rodman on construction work in 1881, on the Delaware, Lackawanna & Western. He entered the service of the Lehigh Valley in 1899 as hydraulic engineer, and from 1903 to 1908 was assistant engineer of the same road in charge of construction of the Sayre shops, and Towanda grade and alinement. In June, 1908, he was appointed chief engineer of the canal department of the Lehigh Coal & Navigation Company, and from January, 1909, to January, 1916, was canal superintendent of the same company. Since August, 1910, he served also as superintendent of the Lehigh & New England, and now becomes chief engineer of the same road, as above noted.

Frederick Knight Bennett, whose appointment as principal assistant engineer of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., was announced in these columns last week, entered railway service in 1895 as a rodman on the Lehigh Valley. He was continuously in the service of this road until March, 1909, as assistant engineer on maintenance, assistant engineer, supervisor of track and division engineer. From March, 1909, until June, 1911, he was engineer in charge of reconstruction on the Missouri Pacific; from June, 1911, to June, 1912, he was assistant engineer with the engineer maintenance of way at Kansas City, Mo. From June, 1912, to June, 1913, he was assistant engineer with the chief engineer at St. Louis, Mo.; from June, 1913, to June, 1914, he was division engineer of the Missouri, Kansas & Texas; and from June, 1914, to March, 1915, assistant engineer of valuation of the Great Northern, with headquarters at St. Paul, Minn., and Spokane, Wash. From March, 1915, to September 1, 1915, he was division supervisor of the Minneapolis & St. Louis, eastern division, being then appointed valuation engineer of the Minneapolis & St. Louis, with office at Minneapolis, Minn., which position he held at the time his recent appointment, as noted above, became effective. A photograph of Mr. Bennett appeared in these columns in the issue of October 8, 1915, page 668.

OBITUARY

J. F. Keegan, superintendent of motive power of the Grand Rapids & Indiana, at Grand Rapids, Mich., died on March 9.

Oscar G. Murray, chairman of the board and former president of the Baltimore & Ohio, died on March 14 at his home in Baltimore, Md., in his 70th year.

William A. Van Mater, who was engineer maintenance of way, New Jersey Southern division of the Central of New Jersey, at East Long Branch, N. J., previous to 1906, died on March 9, at Red Bank, N. J., at the age of 68.

Equipment and Supplies

LOCOMOTIVES

THE PERE MARQUETTE has issued inquiries for 6 Santa Fe type locomotives.

THE ILLINOIS TERMINAL has ordered one Mogul type locomotive from the Baldwin Locomotive Works.

THE MIDLAND VALLEY has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE PHILADELPHIA & READING has ordered 20 Consolidation locomotives from the Baldwin Locomotive Works.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS has ordered 10 Mikado locomotives from the Baldwin Locomotive Works.

THE REPUBLIC IRON & STEEL COMPANY, Youngstown, Ohio, has ordered 2 Mogul type locomotives from the Baldwin Locomotive Works.

THE DETROIT EDISON COMPANY, Detroit, Mich., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE PUBLIC SERVICE ELECTRIC COMPANY, Newark, N. J., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE MILWAUKEE COKE & GAS COMPANY, Milwaukee, Wis., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE GRAND TRUNK has ordered 5 superheater Mikado locomotives from the American Locomotive Company and 10 of the same type from the Canadian Locomotive Company. These locomotives will have 27 by 30-in. cylinders, and a total weight in working order of 276,000 lb. The engines ordered from the Canadian Locomotive Company are for use in Canada. Those ordered from the American Locomotive Company will be used on the Grand Trunk's lines in the United States.

FREIGHT CARS

THE SOUTHERN RAILWAY is reported as having ordered 2,000 cars from the Pressed Steel Car Company.

THE UNION TANK LINE has ordered 1,000 10,000-gal. capacity tank cars from the American Car & Foundry Company.

THE CHICAGO, BURLINGTON & QUINCY has ordered 125 12,000-gal. capacity tank cars from the Standard Steel Car Company.

THE CHICAGO & NORTH WESTERN, reported in last week's issue as being in the market for 50 way cars, has ordered these cars from the American Car & Foundry Company.

PASSENGER CARS

THE INTERBOROUGH RAPID TRANSIT, reported in the *Railway Age Gazette* of February 16 as inquiring for subway cars, has ordered 337 motor car bodies, 140 trailer car bodies, 332 motor trucks and 617 trailer trucks from the Pullman Company.

IRON AND STEEL

THE PERE MARQUETTE has ordered 10,000 tons of rails for 1918 delivery.

THE MICHIGAN CENTRAL has ordered 7,000 tons of rails from the Illinois Steel Company for 1918 delivery.

THE MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE has ordered 510 tons of steel for one deck girder span and 5 riveted truss spans at Chippewa Falls, Wis.

THE ALASKAN ENGINEERING COMMISSION has placed an order with the United States Steel Products Company for rails, angle bars, track bolts and spikes costing approximately $467,000.

Supply Trade News

William C. Dodd, president of the National Lock Washer Company, Newark, N. J., died on March 12 at the age of 46 years, at his home, in East Orange.

Mark R. Briney has accepted the position of eastern manager of the Federal Signal Company, with headquarters at the company's New York office, 52 Vanderbilt avenue.

The Reading Chain Block Company, Reading, Pa., last week shipped a carload of chain hoists ranging in size from 1,000 lb. to 20 ton capacity to the United States Government for use in the Norfolk Navy Yard or on board naval vessels.

Robert L. Arms, for several years connected with the sales department of Manning, Maxwell & Moore, has become associated with the Sherritt & Stoer Company, Inc., 603-604 Finance building, Philadelphia, as assistant to the general manager.

G. A. Nelson, for many years secretary and treasurer of the Gordon Primary Battery Company, has been appointed special representative of the Waterbury Battery Company of Waterbury, Conn. Mr. Nelson was born in Chicago. He started his business career in that city with the Champion Chemical Works, grinders and packers of caustic soda and similar chemicals. In 1896 he was in Toronto, Ontario, in temporary charge of the Canadian business of E. W. Gillett, of Chicago, who was the controlling factor in the Champion Chemical Works. In 1897 he came to New York to open up and become manager of a branch factory for that company. In 1901 he was elected secretary and treasurer of the Gordon Primary Battery Company, and continued his connection with that company until January 1, 1916, at which time he accepted the agencies for several lines of railway tools and supplies, which interests he will retain. Mr. Nelson has been an active member at the various railroad conventions. From 1914 to 1916 he was secretary-treasurer of the Railway Telegraph & Telephone Appliance Association. As special representative of the Waterbury Battery Company he will have his headquarters in New York.



G. A. Nelson

Ernest H. Weigman, formerly general supervisor of master car builders' billing on the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been appointed assistant secretary of the Master Car Builders' Association, with office in the Karpen building, Chicago.

Frank N. Grigg, of Richmond, Va., several years representative of the Harlan & Hollingsworth Corporation in southern territory, has been elected secretary of the corporation, succeeding Henderson Weir, deceased. William T. Thompson, who has been connected with the company for many years, and superintendent of the car department under Mr. Weir's management, will be manager of the car department.

Fire originating in the upholstery department of the Pullman Company, Chicago, Ill., caused approximately $100,000 damage on the night of March 9. The building, which was two stories high, of brick construction, and 250 ft. by 150 ft., was protected by four thick fire walls, two of which were burned entirely through. Besides the destruction of the building itself much valuable material, such as plush draperies, valuable hard woods and oils was consumed by the flames.

The Dodge Manufacturing Company, Mishawaka, Ind., announces the acquisition of properties and products of the Oneida Steel Pulley Company and the Keystone Steel Pulley Company of Oneida, N. Y. The Dodge Steel Pulley Corporation was formed to control the two Oneida companies and will be a subsidiary of the Dodge Manufacturing Company. The new corporation has been authorized to increase its capital stock from $550 to $550,000, resulting in an increase of shares of from 10 to 10,000. The sale and distribution of products of the corporation will be under the supervision of the Dodge Sales & Engineering Company, Mishawaka, Ind.

Harlow A. Varney, announcement of whose appointment as manager of the railroad department of the Paige & Jones Chemical Company, of New York City, with headquarters at Chicago, Ill., was made in these columns last week, was born at Spencer, Ia., September 9, 1887. After leaving high school at Spencer he attended the Iowa State College at Ames. He began his career in the railway supply field with the Julian L. Yale Company in 1907, leaving this concern in 1910 to enter the employ of the National Boiler Washing Company as general sales manager. After five years with this latter company he was appointed manager of the railroad department for the Smith-Totman Company and later became secretary and treasurer. He now becomes manager of the railroad department for Paige & Jones Company, his territory covering the United States and Canada.



H. A. Varney

William C. Dodd, president of the National Lock Washer Company, Newark, N. J., died suddenly at his home in East Orange, N. J., Monday morning, March 12. He was 46 years old. Mr. Dodd had been connected with the National Lock Washer Company since 1886. He was secretary and treasurer of the company for many years and succeeded his father as president upon the death of Mr. Dodd, senior, 12 years ago.

Henderson Weir, secretary of the Harlan & Hollingsworth Corporation, Wilmington, Del., died suddenly Sunday, March 4. Mr. Henderson had been connected with this company for about 21 years, during the major part of which period he acted as manager of the car department, looking particularly after the sales end of the business.



W. C. Dodd

Albert Clark Stebbins, a vice-president of the Niles-Bement-Pond Company, New York, died February 28 at his home in Plainfield, N. J., at the age of 73 years. He was born in Monson, Mass. In the year 1865 he became an apprentice in the machine shop of Lucius W. Pond, Worcester, Mass. He continued as a machinist in this shop until about 1870, when he was appointed New York representative of L. W. Pond, with an office on Liberty street. About 1875, when the Pond business passed into the hands of David W. Pond, son of Lucius W., Mr. Stebbins re-

turned to the Worcester shop in the capacity of superintendent. In 1887 the shop at Worcester was taken over by the Pond Machine Tool Company of Plainfield, N. J., and the shop equipment was moved to new buildings in the latter town. Mr. Stebbins went to the Plainfield works as vice-president and general manager and directed the construction and equipment of the new shops. He continued in this capacity until the organization of the Niles-Bement-Pond Company, when he was elected vice-president of this company and local manager of the Pond works.

Steel Corporation's Unfilled Orders

Unfiilled orders of the United States Steel Corporation on February 28 totaled 11,576,697 tons, 102,643 tons more than on January 31. This again makes a new record, the largest previous total being that of December 31, when the unfilled orders were 11,547,286 tons.

American Steel Foundries

The American Steel Foundries completed its most successful year in 1916. The gross sales for the year amounted to $31,361,006, as compared with $10,024,870 for the preceding year, and $19,463,521 for 1907, the highest previous record. The December business alone amounted to over $4,800,000, and the totals for the last quarter of the year approximated $12,000,000, or about two-fifths of the business done in the entire year. The earnings from operations, after deducting all manufacturing, selling, administrative, and head and district office expenses, were $4,842,237. After deducting the depreciation and interest charges, and adding miscellaneous income, the net profits were $3,968,570, which represents 12.8 per cent on the gross business done, and about 23 per cent on the capital stock. The amount spent for repairs and maintenance during the year, and absorbed in manufacturing cost, is $1,848,185. During the year the company reduced its 6 per cent bonds to the extent of $373,000 leaving a total outstanding on December 31 of $1,586,500 of the original issue of $3,900,000. The company also bought in $314,000 in 4 per cent debenture bonds at an average cost of 87.48. Miscellaneous operating reserves showed the gain for the year of nearly $96,000, the total balance on December 31 being $322,112, out of which $101,482 stands to the credit of a workmen's compensation reserve fund, and is over and above all known liabilities for unsettled claims. With reference to the dividends paid during the year R. P. Lamont, president, said in part:

"A dividend of 1¼ per cent was paid during the last quarter of the year. In view of the earnings, it may seem to some of our stockholders that dividends could have been resumed at an earlier date, but the large volume of our business kept us short of cash during the entire year, and the many uncertainties surrounding the whole business situation made it necessary to follow a conservative policy as to dividend disbursements. It must be kept in mind that a considerable part of the earnings for the year were derived from business outside of our regular line of work, and necessarily of a temporary character. In the judgment of the directors, it would be a mistake to pay out these excess earnings in dividends. They should be conserved until all of our contracts for war materials are finished, and if at that time conditions warrant it, these excess profits should be used to call and retire our 6 per cent bonds and provide for the payment of debentures when due. At the present time we are obliged to take from our profits about $750,000 a year for interest on and retirement of bonds and debentures before we have anything for surplus available for dividends. This is equal to 4½ per cent of our outstanding stock. It has been a heavy load in dull years, and it will be a great relief to get these bonds and debentures out of the way."

The balance sheet reads as follows:

Assets		Liabilities	
Realty patents, etc.	$20,283,477	Capital stock	$17,184,000
Real estate not used	298,630	Bonds and debentures	1,586,500
Sinking fund assets	143,122	American Steel Casting bonds and debentures	2,060,800
Bonds, notes, etc.	682,122	Notes payable	1,200,000
Inventories	6,081,689	Accounts payable	4,267,069
Receivables	5,665,962	Payroll accrued	308,752
Cash	576,611	Accrued interest	92,847
Insurance, etc.	153,412	Renewal reserves	322,112
		Sinking fund	3,211,295
		Profit and loss	3,651,670
Total assets	$33,885,025	Total liabilities	$33,885,025

Railway Construction

AMERICUS & ATLANTIC.—Application has been made by this company in Georgia for incorporation. Work is now under way building from Byromville, Ga., on the Atlanta, Birmingham & Atlantic, southwest to Americus, 26 miles, with a spur to Bauxite mine 5 miles; track has been laid on 14 miles, and the construction of a trestle and bridge have been finished over Flint river. J. S. Morton, Byromville, Ga., is the contractor, and will probably be president of the railroad. This work is on a section of the line projected under the name of the Americus, Hawkinsville & Eastern, which was organized to build from Hawkinsville, southwest to Americus, about 55 miles.

AMERICUS, HAWKINSVILLE & EASTERN.—See Americus & Atlantic.

ATLANTA & WEST POINT.—A contract is reported let to the Brooks-Callaway Company, Atlanta, Ga., to build second track from College Park, Ga., to Palmetto, about 16 miles.

BOISE, TWIN FALLS & NEVADA.—This is the name of a company which has been incorporated with a capitalization of $3,000,000 to construct a line from Boise, Idaho, to the end of Breneau Valley, about 90 miles. Permanent surveys will be made in the spring.

FRANKLIN COUNTY TRACTION.—This company has been incorporated under the laws of Illinois with a capitalization of $50,000 for the construction of an interurban railway running from North City, Ill., through Christopher and Buckner to Benton, about 23 miles. Later it is intended to extend the line to Du Quoin, Paradise and Walkertown. Except for about 10,000 cu. yd. of steam shovel work, the company's own forces will do all work. It is estimated there will be 15,000 cu. yd. of grading per mile. The maximum grade will be 2½ per cent. There will be three plate-girder bridges and about 350 lineal ft. of pile trestles. Some rolling stock will be purchased in March. Plans for car barns, powerhouse, depots, repair shops and terminal facilities are not yet completed.

GREAT NORTHERN.—As soon as the weather permits this company will award contracts for the double tracking of its line between, Shelby, Mont., and Cutbank, about 24 miles. Other double tracking between Whitefish, Mont., and Columbia Falls will also be undertaken in the near future.

GULF, MOBILE & NORTHERN.—This company is now extending its line northerly from Middleton, Tenn., to Jackson, about 40 miles, and contract covering the construction of roadbed, bridge sub-structures, etc., for the first 20 miles north from Middleton has been let to M. O. Wogan, Denver, Colo. Contracts for the remaining 20 miles will be let at an early date. The company will supply the necessary track materials, and will perform all labor necessary to complete the work above the sub-grade level. This line is being built on a .6 per cent grade and a maximum curvature of 3 degrees. About one-half of the work is steam shovel work, and the balance of a lighter character. There will be one bridge consisting of a through truss structure of less than 150-ft. span and a 500-ft. single track tunnel; contract for the tunnel has not yet been awarded.

HENDERSON & WILSON.—This company has been granted a charter in North Carolina, but has not yet completed its organization. The plans call for building a line from Henderson, N. C., southeast to Wilson, about 55 miles, also extensions. The promoters expect to develop a traffic in farm produce and lumber. The Board of Trade, Henderson, is interested in the project.

NORTHERN PACIFIC.—This company has awarded contracts for the building of a low grade freight line between Logan, Mont., and Bozeman, about 33 miles. The grade between these two points will be 0.4 per cent. The estimated cost of the undertaking is $2,000,000.

PENNSYLVANIA LINES WEST.—This company has awarded a contract to P. T. Clifford & Son, Valparaiso, Ind., for additional yards and new engine facilities at Akron, Ohio. There will be about 100,000 cu. yd. of grading. The contract price is $286,000.

SAN DIEGO & ARIZONA.—The Utah Construction Company, Ogden, Utah, has been awarded a contract for about 20 miles of grading running into the Imperial valley of California. The country through which the line will run is very rough and mountainous, and the grading will be extremely heavy. The bridging and track laying contract will be let to another company. Work is expected to begin immediately.

RAILWAY STRUCTURES

ALTOONA, PA.—The Pennsylvania Railroad will replace the present bridge over Twenty-fourth street in Altoona, with a new structure. The work is to be carried out by company forces, and calls for putting up three spans, two of 10 ft. each over the sidewalks, and one of 30 ft. over the roadway, all of half through girders with concrete deck.

ANDREWS, S. C.—The Seaboard Air Line has under contemplation the following work at Andrews: Combination freight and passenger station, coal elevator, sand house, cinder pit, turntables and tracks, boiler house, coal trestle, lead, standing and yard tracks.

CODY, WYO.—The Chicago, Burlington & Quincy intends shortly to erect a dining room at this point for the convenience of its patrons visiting Yellowstone National Park. The dining room will be enclosed in glass and able to accommodate 250 persons at a time. In addition there will be a large lounging room for tourists and other conveniences. All plans have been completed, and it is expected to begin operations at once, it being the intention to complete the building by June 20, when the park season opens. The estimated cost of this improvement is $25,000.

DOUGLASSVILLE, PA.—The Philadelphia & Reading has given a contract to W. H. Wiand, Pottstown, Pa., for building a new passenger and freight station at Douglassville to replace the structure destroyed by fire about two months ago. The new building will be a one story and attic brick structure. The exterior brick work above window sills will be covered with stucco, and below the window sills there will be a stone base.

HAZLETON, PA.—The Wilkes-Barre & Hazleton contemplates building a freight station in Hazleton, west of the present location, which is on West Broad street.

HUNTINGTON, W. VA.—A contract has been given to Board & Duffield, Charleston, W. Va., for grade separation work on the Chesapeake & Ohio at Tenth street, Huntington. The street is to be carried under five tracks and a station platform, and the estimated cost of the work is $75,500.

PHILADELPHIA, PA.—The Philadelphia & Reading has given a contract to L. F. Shoemaker, Pottstown, for the superstructure for a bridge to be built over Ridge avenue at Laurel Hill, Philadelphia. The new bridge will consist of three through plate girder spans about 90 ft. long, and will replace the existing deck structure.

RICHMOND, VA.—A contract has been given to W. W. Boxley & Co., Roanoke, Va., for building a bridge over the James river at Richmond for the joint use of the Atlantic Coast Line and the Richmond, Fredericksburg & Potomac. It is to be a double track concrete arch bridge, and will have three 60-ft. spans and 15 116-ft. spans.

RUTHERFORD, N. J.—The New Jersey Board of Public Utility Commissioners has approved plans for the elimination of grade crossings of the Erie Railroad, at Park avenue and the Rutherford station. The plans include the construction of island platforms between four main line tracks at the station and a subway under the tracks.

SALISBURY, N. C.—The Southern Railway is carrying out improvements between Morristown, Tenn., and Salisbury, N. C., 228 miles, and every frame trestle on this section will be replaced by permanent structures of steel and concrete. The work includes the construction of 18 new steel bridges to replace lighter structures; the encasing of 5 stone and brick arches in reinforced concrete; the elimination of 119 trestles by the construction of 6 underpasses for highway and 14 concrete culverts, and the filling of the remaining trestles, large concrete and cast iron pipe being placed to take care of drainage.

Railway Financial News

ALABAMA GREAT SOUTHERN.—Potter, Choate & Prentice are offering $1,350,000 first consolidated mortgage 5 per cent bonds of the Alabama Great Southern at 99.

CHICAGO, ROCK ISLAND & PACIFIC.—An injunction has been granted against the Bankers Trust Company as trustee for the $20,000,000 debentures of the Rock Island which are in default, from proceeding in the Federal Court in Illinois to enforce a judgment for $21,500,000 recovered on January 23, because of the default of interest on these debentures.

COLORADO MIDLAND.—This property is to be sold on April 21 under foreclosure of the first mortgage securing $9,532,000 outstanding bonds. The upset price has been fixed at $500,000.

ERIE.—The New York Public Service Commission, Second District, has approved of the issue of $15,000,000 5 per cent two-year notes of the Erie to be sold partly for refunding purposes. The commission has also approved of the issue of $3,680,000 4½ per cent equipment trust certificates, secured by equipment costing $4,464,531.

MISSOURI, KANSAS & TEXAS.—Suit has been brought to foreclose the mortgage securing the Missouri, Kansas & Texas, of Texas, first mortgage 5 per cent bonds. Interest due September 1, 1916, and March 1, 1917, is now in default on these bonds.

MISSOURI PACIFIC.—The United States Circuit Court at St. Louis has confirmed the sale of the Missouri Pacific and the St. Louis, Iron Mountain & Southern to representatives of the reorganization committee. The new Missouri Pacific Railroad Company which has been incorporated in Missouri will take over the property as soon as the necessary legal steps can be completed.

PENNSYLVANIA RAILROAD.—Stockholders at the annual meeting on March 13 authorized an increase in the indebtedness of the company to the extent of $75,000,000. The directors are empowered to issue such bonds or other obligations of the company as seem to them desirable.

RUTLAND RAILROAD.—A dividend of 2 per cent on the outstanding $9,057,600 preferred stock has been declared, payable April 16. The New York Central and the New York, New Haven & Hartford own a majority of the Rutland preferred. This is the first dividend declared since 1908. There is almost no outstanding common stock of the Rutland.

RAILWAY CONSTRUCTION IN BOLIVIA.—The president of Bolivia has been authorized by congress to undertake, under the direct supervision of the state, the construction of the Uyuni-Tupiza Railway between Atocha and Tupiza. The Atocha-Tupiza section is all that remains to be constructed of the line which eventually will connect La Paz with Buenos Aires. It is believed that this through Bolivian route will become an important rival of the Panama Canal, since it will offer quicker and more direct transportation from Europe to the west coast of South America.—*Commerce Report.*

NEW ZEALAND IRON AND STEEL ENTERPRISE.—A company has recently been formed in New Zealand, with a capital of £70,000 (about $340,000), with the object of producing iron and steel from magnetic and titaniferous iron sand, of which there is a large deposit on the coast at Taranaki, near New Plymouth, North Island. Works are being erected at New Plymouth, and it is hoped that they will be ready to produce pig iron in February. The present intention is to install a furnace capable of dealing with 70 tons of iron sand weekly, but plans have been drawn up for the installation at a later date of an additional furnace capable of dealing with 200 tons weekly. The company claims that pig iron can be produced from these iron sands at a cost not exceeding £3 ($14.60) a ton. The production of steel is also contemplated, and it is intended later to form a new company to carry out this development. Meanwhile the company will proceed with the production of pig iron for foundry purposes.—*Commerce Report.*

Railway Age Gazette

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WE GUARANTEE, that of this issue, 6,635 copies were printed; that of these 6,635 copies, 5,310 were mailed or delivered by messenger to regular paid subscribers; 700 were distributed among members and guests of the Railway Signal Association and at the Coliseum; 500 copies were provided for office use to fill future orders; 75 copies were mailed to advertisers, and 50 copies were mailed as samples.

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NOTICE OF COPYRIGHT

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So far as the proceedings of the conventions are concerned, our coypright covers them only as they are reported by the Daily Railway Age Gazette, and the associations and their members, individually, are hereby authorized to make any use they desire of our reports, except that they must not be republished without the express permission of the Simmons-Boardman Publishing Company in any publication or periodical except those issued by the Railway Signal Association or the American Railway Engineering Association.

The Brotherhoods' Victory and Track Labor.

The engineering and maintenance of way officers of the railways may well regard not only with interest, but with concern, the developments in the controversy between the railways and their train service employees which, presumably, was terminated yesterday by the decision of the United States Supreme Court upholding the Adamson act. The employees in the engineering and maintenance departments of the railways are at present organized only to a limited extent. Their wages, and more particularly those of section foremen, are relatively much lower than those of the men in train service. While the men in train service have won a "basic eight-hour day," which means they will get overtime after eight hours, section foremen and many other employees in the bridge and building and track departments have a ten-hour day and do not receive anything for overtime. There is considerable discontent among these classes of employees now, and the increase in the difference between their basis of compensation and that of the train employees which has just been made is not going to reduce the discontent among them. Unless the managements of the railways frankly recognize the fact that their unorganized employees are entitled to as good treatment as their organized employees, the labor troubles of the railways are going constantly to grow more numerous and serious.

The Two-Ohm Track Relay Recommendation

The most important subject before the R. S. A. meeting yesterday was the adoption of the two-ohm track relay. Although it was nearly 6 o'clock before it was reached, the discussion was so active that the members present remained till after dinner time to hear its conclusion. The committee unqualifiedly recommended "the adoption of the two-ohm relay by the Association." The opposition which developed—and it was determined—was directed against the broad form of the recommendation rather than against the two-ohm relay itself. The conservative element was unwilling to admit that any amount of theoretical calculation or experimentation on

"toy railroads" would furnish proof of the superiority of the two-ohm as compared with the four-ohm relay even for use with low internal resistance batteries. There was an insistent demand for longer service tests under all sorts of conditions. The same men who were opposing the committee on its stand that previous demonstrations and tests warrant the recommended action made it very clear that they were anxious to have the proposed type of relay given full consideration and extensive use to determine absolutely what its relative merits are before it is formally adopted by the Association. Mr. Stevens, in particular, prophesied that if the report as presented went to the annual meeting and then to letter ballot it would be killed, thereby tabling the matter, while if the statement were modified before it was presented for final action, the valuable work done in developing this low-resistance relay would be made available to the Association and members would be encouraged to use the new type more freely. A compromise motion was finally passed which accomplished the purpose of modifying the report and at the same time putting it definitely before the Association. The remarkable fact that the entire committee, including manufacturers' representatives, were unanimously in favor of the full adoption of the two-ohm relay indicates that as others study the question more carefully they will see greater advantages in it than they do now and its use will spread rapidly.

THE TRIUMPH OF FORCE

For some days it looked as if a strike of the train service employees of the railways would render it almost impracticable to hold the convention of the American Railway Engineering Association this week. The strike crisis was suddenly ended yesterday morning when the Conference Committee of the railways gave full authority to the government mediators to grant the brotherhoods whatever was necessary to get the strike order withdrawn; and immediately on the heels of this came the news that the Supreme Court of the United States had rendered a decision upholding the constitutionality of the Adamson law.

The action of the Conference Committee was prompted by receipt of the news that German submarines had sunk three American vessels and that the result was likely to be an early announcement of war between the United States and Germany. In other words, it was dictated by patriotic considerations. The fact that it was the railways which made the concessions to avert the strike indicates what was the attitude of the leaders of the brotherhoods up to the last. The committee of the Commission on National Defense appointed by President Wilson and composed of Secretary of the Interior Lane, Secretary of Labor Wilson, and Daniel Willard, president of the Baltimore & Ohio, had been engaged for two days in presenting to both sides the imminent peril to the country and the extent to which a general railway strike would interfere with preparations for and prosecution of a foreign war. These representations had no effect on the leaders of the brotherhoods. The dangers to which they were subjecting the country apparently meant nothing to them. It appeared certain that the strike would come on Monday evening regardless of the prospects of war unless the railways gave way.

The decision of the Supreme Court in the Adamson law case, which followed so quickly after the railroads had yielded to the terms of the brotherhoods, demonstrated how little justification the brotherhoods had for issuing their most recent strike order. At the time this editorial was written the reports regarding the decision were fragmentary, but they seemed to indicate that the Court has upheld the power of Congress to regulate the hours of work and the wages of railway employees, and has sustained the provision of the Adamson act which, in effect, requires the railways to pay the train employees the same wages for eight hours' work which they have heretofore paid for ten hours. The chief argument presented to the brotherhoods as to why they should not strike while the litigation was pending was that the decision might be favorable to them, in which case it would develop that in effect they already had been given since January 1, 1917, as a result of legislation, the very increase in wages for which they were threatening to strike. The decision of the Supreme Court shows that this was exactly the situation.

The outcome of the struggle so far as money goes is a victory for the labor brotherhoods. They succeeded in getting Congress to pass a law arbitrarily increasing their wages by about $60,000,000 a year, and they also succeeded in getting the railways to agree to give them this increase regardless of whether the law was held constitutional or not.

The moral victory, however, should rest with the railways. They stood ready from the start to arbitrate all their differences with the train service employees and to grant them whatever an arbitration board might award. The employees, meantime, relied not at all upon reason or peaceful means for success, but entirely on force. When the time came that it was necessary for one side or the other to give way in order that the country might not find itself paralyzed by a general railway strike and at the same time involved in a great foreign war, it was the brotherhoods, the exponents of force, who refused to give way, and it was the railroads, who had all along been willing to arbitrate, who on patriotic grounds made concessions.

The contrast between the course which the brotherhoods have followed and that which the railways have taken is so sharp and striking that the public must be very dull and ungrateful, indeed, if it does not appreciate and show its gratitude for the patriotic course taken by the railway managers.

While the dark cloud may have a silver lining, it is, nevertheless, a dark cloud. By the act of Congress and the decision of the Supreme Court, $60,000,000 a year has been added to the payroll of the railways; and the legislation which has given this increase in wages was secured by the threat of force, and by nothing else. This victory for force in industrial disputes may have disastrous effects not only for the railways but for all classes of industry and for the public as a whole. It may be that recent developments will demonstrate to the public the need of, and cause Congress to enact, legislation for the prevention of railroad strikes. But the man who can really believe that our politics-ridden Congress will actually pass such legislation, after its refusal to pass it last winter, is an optimist, indeed.

If such legislation is not passed it will be a matter of but a short time until a great railway strike will occur. The exponents of force having won by it in this case, they and other railway labor unions will be disposed to rely on it in future. The time will come when they will again rely on it, but when the country will not be confronted with any emergency which will make the railway managers feel that for patriotic reasons they must yield to force. Then, in the absence of any strike legislation, the strike will come. The government has done nothing but palter with this great question of strikes on railways for over a year. Its course has been one of consistent

and unsurpassed cowardice. The American public will be very fortunate if it escapes paying very dearly for its government's cowardice and imbecility.

HOW TO GET MORE FROM THE EXHIBIT

Many railway men come a considerable distance to attend the exhibit of appliances at the Coliseum this week, and many supply companies spend liberally of money and time to present their products in an interesting and instructive manner. It is only logical, therefore, that every possible effort should be made to secure to the individuals and to the roads represented the greatest possible benefit from the expenditure of time, effort and money invested in this exhibition.

The average memory training system accomplishes its end by offering some plan or incentive for concentrating on the things to be memorized. Similar concentration is essential in studying these exhibits if the greatest good is to be derived. The contest, which we have previously announced, on what was learned at the appliance exhibit offers both a plan and an incentive for systematic, concentrated study.

This contest is being conducted jointly by the *Railway Age Gazette*, the "Railway Maintenance Engineer" and the "Railway Signal Engineer," all published by the Simmons-Boardman Publishing Company. There are two main divisions to the contest, one for those interested primarily in maintenance of way matters, and one for those interested primarily in signaling matters. Prizes of $50, $25 and $10, respectively, are offered in each of these two main sections, and a single prize of $60 is offered for the best paper covering the exhibit as a whole with the understanding that no individual will be awarded more than one prize. Any paper received which covers both maintenance and signal exhibits will be considered for the combination prize, and those that fail to win it will still be eligible for consideration in the two main divisions of the contest. If the author does not specify whether his paper is primarily on maintenance or signaling, it will be placed in the group to which in the judgment of the editors it seems best suited.

The prizes in the division of the contest referring to maintenance will be awarded by A. S. Baldwin, chief engineer, Illinois Central, C. F. W. Felt, chief engineer, Atchison, Topeka & Santa Fe, and W. H. Penfield, assistant to the vice-president, Chicago, Milwaukee & St. Paul. The judges for the contest on papers referring to signaling will be J. A. Peabody, signal engineer, Chicago & Northwestern; H. K. Lowry, signal engineer, Chicago, Rock Island & Pacific, and W. M. Vandersluis, signal engineer, Illinois Central. The single prize of $60 for the joint paper will be awarded by W. B. Storey, vice-president of the Atchison, Topeka & Santa Fe, in cooperation with Mr. Baldwin and Mr. Peabody.

In making the awards, the judges will consider, first, the practical value of the information which the writers present based on their study of the exhibits, and the extent to which the information will be of direct service to those who have not attended the display; second, the value of the suggestions offered to make the exhibit of greater benefit to railway men; and, third, the clearness and conciseness with which they cover the exhibit. In preparing these papers, it is desired that the writers treat devices and materials by classes rather than as the products of individual manufacturers, and that the names of companies be used only when necessary to make the meaning clear. The contest is open to anyone employed in railway service. Papers may be of any length not exceeding 2,500 words. They should be mailed to the Editor of the *Railway Age Gazette*, 608 S. Dearborn street, Chicago, not later than April 9, 1917.

THE PRESENT STATUS OF LIGHT SIGNALS

In the opinion of some speakers at the R. S. A. stated meeting yesterday we are soon to witness the passing of the motor-operated signal in favor of light indications only. On the other hand, one member expressed the thought of many when he prophesied that most of us would be "dead and gone" before light signals are in general use. There has been a great deal of discussion in recent years both for and against light signals and the issue with semaphores has been clouded by the development of the position-light and colored-light types. Committee I has done a service in its report by making a start toward an analysis of the relative advantages of these types of indication under various conditions.

If the recommendations of this committee are taken by themselves they constitute a very definite approval of the light signal. The advantages mentioned include a reduction in the number of failures, greater visibility and range, uniform indications at all times, greater possible number of aspects, reduced cost of operation "when power is available," and a lower maintenance cost. As no disadvantages are stated to offset against these points in favor of light signals, some question might naturally be raised as to why more rapid progress has not been made in the adoption of such indications. What, then, is the present status of light signals?

The roads which have done most in replacing semaphores by lights report satisfaction, but it is not uncommon to find a signal engineer who openly expresses his approval of light signals and who has very few if any units of this type in service on his road. The fact that Committee I did not present any criticisms of the exclusive use of lights does not indicate that no such objections exist in the minds of signalmen. Whether these objections are important or, in fact, whether they apply to the latest designs, will have to be demonstrated further. Such objections, however, are deterring some men from adopting these new types, and probably the shortness of the time during which light signals have been in extensive use also prompts those naturally inclined to conservatism to await further proof. The committee itself calls attention to its desire to withhold final recommendation until it has had opportunity for more extensive study of the subject. There is one other consideration that delays the general adoption of any standard differing as radically as this one does from common practice. A great many installations are made which utilize old material to some extent or which are so located that a radical change in the type of indication would introduce complications in operation. Under such conditions there may be a hesitancy to adopt light signals which would not exist on extensive installations in new territory.

It may be said, then, that light signals of both the position and color types have definitely established their place in the field. If they are ever to completely displace semaphores, however, it will probably be after all of those now prominent in signaling have given way to the next generation. Just how rapidly the newer types will be adopted depends on many things, possibly the most important of which is the progress made in future development work on these signals.

BANQUET TICKETS

Tickets for the annual dinner of the American Railway Engineering Association, which will be held in the Gold Room of the Congress Hotel on Wednesday evening, will be placed on sale at noon today in the office of the Secretary, Room 1166 Congress Hotel. Because of the large number who are expected to desire tickets, it is requested that reservations be made early.



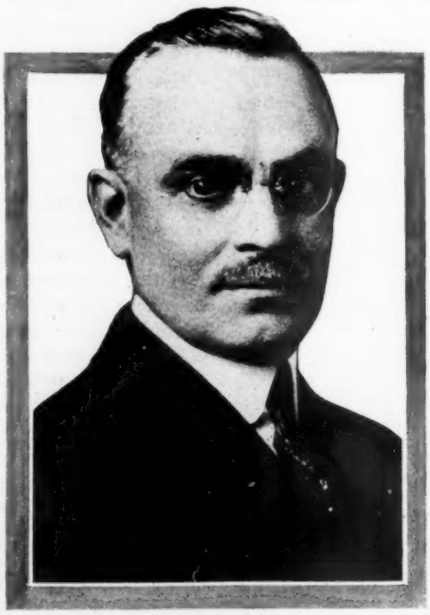
The R. S. A. Stated Meeting in Session

Railway Signal Association Stated Meeting

Complete Abstracts of the Reports of Nine Committees Presented at Monday's Sessions and Discussions on Them

THE March stated meeting of the Railway Signal Association was held on Monday, March 19, in the Auditorium Hotel, Chicago. The morning session was called to order at 9:45 by President C. A. Dunham, signal engineer, Great Northern, and adjourned at 1:30 p. m. The meeting recommenced at 2:30 and was in session until 6:20.

The advance indications pointed to such a decrease in attendance as compared with previous years that the officers arranged with the hotel management for the use of a smaller room on the ninth floor in place of the Recital hall, which had been used for the two preceding years. The change proved to be a wise one. The smaller room was filled practically to capacity all day, but was never seriously overcrowded, and the closer grouping of the members made it much easier for all present to hear the discussion and enter into it.



C. A. DUNHAM,
President

In spite of the threatened strike, which forced many members to abandon their plans to attend, the enrollment was highly encouraging. The secretary announced about the middle of the forenoon session that 114 had registered up to that time, and shortly after lunch he revised that figure to 150. The final registration was 164, of which 90 were active, 13 junior and 61 associate members. This compares with a total registration of about 240 last year.

In opening the meeting President Dunham referred to the uncertainty which existed until a very late hour as to the possibility of holding the meeting, and expressed the satisfaction felt by all that a settlement of the impending strike of trainmen had been effected in time to allow the members to come to this meeting. He said, in part: "On the morning of the 16th the situation seemed to me to warrant calling off the meeting for today, and at that time I took counsel by telegraph with the two vice-presidents, Mr. Elliott and Mr. Trout, setting forth the situation as it appeared to me at that time. Mr. Elliott concurred in my view that the meeting had best be called off, but Mr. Trout wired back that in his opinion the meeting should be held as scheduled, and at this time I want to give Mr. Trout credit for a lot of courage and wise counsel."

The discussion on several of the reports occupied so long a time that it was impossible to consider the reports of the committees on Storage Battery and Charging Equipment and D. C. Automatic Block Signaling. Abstracts of the reports of these committees are included below, however. In addition to the standing and special committees, the Journal included abstracts of the minutes of seven regional committee meetings.

At the opening of the afternoon session C. E. Knickerbocker, cost engineer for the Division of Valuation of the Interstate Commerce Commission, addressed the convention at considerable length, outlining the methods of producing prices and weights for mechanical interlocking, and the freight for the same, followed by the Interstate Commerce Commission in its work, and also the methods which this organization uses for producing prices for power interlocking, block signals and the freight for same.

Secretary Rosenberg announced at the close of the afternoon session that the next meeting of the Association will be held at the Hotel McAlpin, New York City, on June 12 and 13.

Committee I—On Signaling Practice



J. A. Peabody, Chairman

THE following outline of work was assigned: (1) Make critical examination of the subject matter in the Manual, and submit definite recommendations for changes. (2) Continue the study of economics of labor in signal maintenance. (3) Report on the problem of signaling single-track roads with reference to the effect of signaling and proper location of passing sidings on the capacity of the line. (4) Report on progress and developments in highway crossing signals. (5) Report on requisites for switch indicators, including method of conveying information as to the condition of the block to the conductor or engineman. (6) Report on the desirability of having an overlap in automatic signaling; if so, is it best to have two stop indications between trains or two caution indications instead, or the latter in special cases only, such as downgrade tracks? (7) Report on the various methods of giving signal indications other than by means of the semaphore (this includes the light signal for day and night indications). (8) Report on the feasibility of separating into distinct types of their own (1) the signals for train operation, and (2) the markers or signs which indicate the location or position, or both, of information signs and switch signals for conveying information to trainmen. The semaphore is now almost universally used for governing train operation. Therefore, design suitable day and night (if necessary) markers or signs for switch signals, derail switches, stop posts, slow posts, resume-speed posts, water station and track-pan markers, highway crossing signals, etc., conferring with committee on Signs, Fences and Crossings of the A. R. E. A. (9) Report on requisites of signal locations for interlockings and block signals. (10) Report on automatic train control. (11) Report on the comparative merits in various locations of alternating current and direct current for operation of automatic signals. (12) Report on applications of aspect for instructions to trains to take siding at a non-interlocked switch.

The committee submitted reports on subjects 3, 6 and 7.

On subject 3, the problem of signaling single-track roads, two sheets of tabular matter had been prepared, the first showing the characteristics affecting the capacity of single-track, and the second, a summary for increasing single-track capacity. On the former, the characteristics are divided into three groups under physical, operating and traffic. In the first of these groups are included grades and curves; location, size and facilities of cities and towns; location of intermediate industrial tracks; railroad crossings and drawbridges; other conditions restricting speed; length, arrangement, spacing and location of sidings; location, arrangement, and capacity of water and fuel stations; and passenger freight terminals. Operating characteristics include the dispatching system; signaling; communication; condition, capacity and efficiency of use of power; amount of traffic on industrial tracks, and speed restrictions. The traffic characteristics are the number of passenger and freight trains, and other conditions affecting tonnage. On the second sheet, the cost of increasing single-track capacity on single track is divided into six items: Cost of improving physical characteristics; cost of improving operating characteristics; cost of depreciation; interest on investment; cost of maintenance and operation; and total cost. The same items appear under the cost of adding a second track with the addition of the cost of the second track and sidings. The committee recommended that these sheets be accepted as information.

Two conclusions were presented on subject 6, the desirability of having an overlap in automatic signaling, with the recommendation that they be accepted for presentation to the annual convention for approval and submission to letter ballot. These recommendations were: (1) Overlaps are undesirable for following movements as adequate advance information can be provided in the signal system, and (2) overlaps are necessary for opposing movements where adequate advance information cannot otherwise be provided.

Giving Signal Indications Other Than by the Semaphore

Three types of light signals have been designed to meet satisfactorily and economically the requirements of railroads and traction lines. First, a long-range signal for high speed traffic. This requires a concentrated light source, very efficient lenses and considerable care in installation and alinement. Second, the majority of traction lines and interurban railways can use a light signal of medium range, relatively inexpensive construction and having considerable spread to projected beam. Third, there is another class of signaling where very short ranges are required, and where medium size and expense is the deciding factor. These signals will be designated as long range, medium range and short range.

In broad daylight, under unfavorable sun and background conditions, there are two alternatives open for the light source of long-range signals: a very high wattage lamp or a lower wattage with a concentrated and accurately located filament. The concentrated filament requires an accurate basing of the lamps so that they may be interchanged without disturbing the alinement of the signal. The automobile headlight requires refocusing when a new lamp is put in place. This cannot be done with the light signal. It would involve too much work and would also involve the employment of two experienced men to take care of realinement whenever a lamp burned out. Moreover, it is difficult, if not impossible, to obtain any very accurate adjustment for maximum candlepower in the field. Such work is properly done in a dark room. The lamps for high-speed signals are, therefore, rebased in a special jig, which permits the accurate location of the base with respect to the filament.

If a commercial concentrated filament lamp were to be used, the diameter of the filament would have to be increased to allow for commercial variations in lamp manufacture. It might be possible to design a lamp filament having sufficient concentration and yet having area enough to permit commercial variations, but, as these commercial variations permit nearly ⅛-in. departure in all directions from a theoretical filament location, the lamp wattage would have to be increased eight or nine times at least to maintain the same degree of concentration and consequently the same candlepower.

The long-range signal has a very small beam spread, on

account of the concentrated filament employed. Consequently, these signals have been designed to facilitate accurate alinement by providing separate horizontal and vertical adjustments. When it is still necessary to provide some means of increasing the spread to take care of curved track, a prism lens, which spreads or "fans" the light in the horizontal plane, but which does not increase the vertical spread, is used, and the light is projected in the most efficient manner possible. By means of this prism, the maximum possible range on curved track is secured with the minimum possible expenditure of power.

In long-range colored light signals, it has been found advisable, in order to increase efficiency and reduce the size, to employ a double lens, by which means a large angle of the spherical candlepower of the lamp is intercepted. The outer lens used at present varies from 8⅜ in. to 10 in. In medium-range signals the double lens is still employed to secure high efficiency, but standard lamps are used. The construction is relatively simple, as no accurate location of filament has to be provided. In short-range signals, to reduce cost, the double lens is omitted and a small lens, usually 5⅜ in. in diameter, has been substituted. In practice a 40-watt lamp with filaments of different resistance, so that one will burn out before the other, or two 25-watt lamps in multiple, are used. If fixed lights are used, so as to locate the signal if the active light is extinguished, the second lamp might be dispensed with but would be used in the fixed light. In any event, on account of the colors cutting down the range, 35 to 50 watts per light are required.

Only two ranges of position-light signals are provided: Long range, 4,000 to 5,000 ft., for high signals, and short range, 1,000 ft., more or less, for dwarf signals. As colors are eliminated, the effective range per candlepower at the lamp is greatly increased, but special provisions have to be made for elimination of sun reflection and phantom lights; this is taken care of by special conical cover glasses, arrangement of reflectors and treatment of the inverted toric lenses, and by use and position of the spherical lamp bulb.

In practice, four 5-watt lamps are used in a row in a plane at right angles to the line of vision so that the current consumption is about one-half of that required in the colored-light signals. The short-range signals are not hooded, but are provided with chiffon screens and frosted cover glasses. These require two 20-watt lamps, burned under voltage, or a maximum of 34 watts per signal. Experiments are now being made with the view of using the same type cover glass as the high signals and reducing the wattage per signal to 10. The high signals are equipped with 5⅜-in. lenses and cover glasses, and the dwarfs with 4-in. The details of construction and development may be obtained from the articles on this subject published in the Railway Signal Engineer for August and September, 1915, and June, 1916.

The following conclusions are reached:

First. Colored and position-light signals, for day and night use, by elimination of all moving parts except the control relays, reduce the number of failures.

Second. Light signal aspects have greater visibility and range under adverse weather and background conditions than the semaphore, while the close indications compare favorably.

Third. Light signals give uniform indications at all times. Other types of signals give the indication by position in daylight, by color at night, and by both during transition periods. The various aspects of the position-light signal are equal in intensity, range and visibility.

Fourth. In general practice, the number of aspects of any one arm of a semaphore is limited to three. With the position-light signal, four distinctive positions may be used, while the number of indications given by colored-light signals is limited only by the colors available.

Fifth. Where power is available, the cost of operating light signals is less than for operating motor signals.

Sixth. Current consumption under normal automatic signal conditions is: for position-light signals, high-watt lamps, 20 watts, and for one colored light, 35 to 50 watts. For interlocking signals, consumption is increased depending upon the number of lights displayed, but the ratio holds.

Seventh. Cost of maintenance of light signals is considerably less than that of motor signals, and, as the colored-light signal has less lights to renew, it has an advantage in this respect over the position-light signal.

Eighth. The field for the economical use of light signals is limited, as noted above, to points where power is available. In this field, the light signals have advantages over other types. The position-light signal can be installed at any location where clearance will permit the present standard semaphore to be erected. The colored-light signal can be used in more restricted clearances.

The committee, in presenting this report, called attention to the fact that the subject has as yet not been sufficiently investigated to permit a final recommendation to be made, and asked that the matter be given full discussion for that purpose.

Committee: J. A. Peabody (C. & N. W.), chairman; W. J. Eck (Southern), vice-chairman; C. C. Anthony (P. R. R.), H. S. Balliet (G. C. T.), C. A. Christofferson (N. P.), C. E. Denney (N. Y. C. & St. L.), C. A. Dunham (G. N.), W. H. Elliott (N. Y. C.), G. E. Ellis (I. C. C.), J. V. Hanna (K. C. T.), J. G. M. Leisenring (I. T. S.), H. K. Lowry (C. R. I. & P.), J. C. Mock (M. C.), F. P. Patenall (B. & O.), A. H. Rudd (P. R. R.), W. B. Scott (So. Pac.), T. S. Stevens (A. T. & S. F.), and W. M. Vandersluis (I. C.).

Discussion

It was voted to accept the recommendation of the committee on Subject No. 3, with reference to the effects of signaling and proper location of passing sidings on the capacity of the line.

Mr. Peabody: On Subject No. 6, the committee recommends that the conclusions be accepted for presentation to the annual convention for approval and submission to letter ballot.

The President: I believe the report of this committee to be of especial importance, and that we should discuss the report as thoroughly as may be possible.

A. R. Fugina (L. & N.): I think Conclusion No. 1 is pretty broad. I believe there are cases where there should be a double caution indication, in special cases downgrade. We are making use of indications of that kind, and find them desirable, especially on the downhill movement.

J. Beaumont (I. C. C.): It seems as though the paragraph should be worded differently to comply with the instructions. It would seem advisable to word that paragraph as follows: "Overlaps are undesirable for following movements where adequate advance information is provided in the signal system." It might also be well to specify just what that protection should be in certain cases, but certainly it is necessary to state that where adequate advance information is not provided, overlaps are necessary.

Mr. Fugina: I would like to have the opinion of the committee. Do they intend to eliminate the double caution indication in special cases?

Mr. Beaumont: It seems to me, where overlaps are not provided, one stop and one caution signal is necessary to successful operation. Whether the committee can go further than that and say what protection should be provided is a question. I do not think it would be possible to make the report sufficiently comprehensive to cover each particular case. For that reason the conclusion as worded is, in a brief way, perhaps as near as they can come to the facts, although it should not be considered as not approving overlaps where we do not have adequate advance information.

Mr. Peabody: I cannot see that our Conclusion No. 1 in any way indicates that we should not use double caution indications if desirable. That answers your question, doesn't it?

Mr. Fugina: Well, it does, but it says "Overlaps are desirable in special cases." That is a specific question that it seems was not thought worth while to consider.

Mr. Peabody: The committee does not feel that, at this time, we should answer in detail what our conclusions would be, but only answer such questions as are asked.

Mr. C. A. Christofferson (N. P.): As far as overlapping is concerned, I have been opposed to it. I have used one on a very heavy downgrade, and I would not do that in the future. If the engineer has his proper caution indication I cannot see that there is any need for two red boards or any overlap on double-track automatics. Of course, on single track automatics we must have a single movement and an overlap.

A. R. Fugina: Is not this contrary to the absolute permissive block signal? We provide a double caution indication for the train entering a passing siding when a train is approaching from another direction. We recognize the double caution signal indication in that particular circuit.

T. S. Stevens (A. T. & S. F.): I do not believe that that is prohibited under the committee's recommendations, because it says "Overlaps are necessary for opposing movements where adequate advance information cannot otherwise be provided." Double caution indication at stations is provided for that purpose, because you cannot provide adequate advance information in any other way. I believe that this meeting, if it can, should give us some definite information about other features of the double caution indication for double-track signals. Usually when we think of an overlap we think of a stop overlap; but when we consider the instructions that we have given this committee, perhaps there is a point in connection with double caution indication we should discuss.

Mr. Christofferson: I feel the same way as to double caution as I did with the double stop indication. I do not think it is necessary if you have a proper braking distance. We use in our signaling system a double caution indication going into a station, as it would be very hard to arrange in all cases so that we could get along with one caution indication, on account of the method we use on the Northern Pacific, and which I suppose is used generally, of controlling the movements through the train order board. In a great many cases our stations are located so close to the end of the siding that one caution indication would be sufficient. In order to carry the same scheme I use there we would have to use two caution indications in all cases. I would rather have one caution indication where the braking distance is sufficient.

B. T. Anderson (D. L. & W.): On the Lackawanna, between Hoboken and Newark, we have double caution indications. The blocks are short, about 1,800 ft. in length, and the road has adopted a standard braking distance of 3,500 ft., so that it was necessary to double up the caution indications in order to take traffic over this busy suburban district. This type of signal installation has been in service for a couple of years and has given good results. We have not adopted that system on any other part of the road.

T. S. Stevens: There is a point which needs emphasis in connection with this matter, and that is the fact that this is a special place where the stop block was not long enough in braking distance and the caution indication is carried back. Again, the advance information is provided as the committee's report states, although technically speaking it is an overlap of the caution indication.

Mr. Christofferson: I do not believe this association should go on record and recommend or advocate any two-red block or two-caution block. I think that should be left to the individual road.

G. K. Thomas (A. T. & S. F.): Will not the meaning of the caution aspect have something to do with this? For instance, on a road where a caution signal means prepare to stop at the next signal, may it not be more necessary to have double caution indication than on a road where the caution aspect means proceed under caution? If it means the brakes must be applied before the caution signal is passed, then there would not seem to be so much reason for double caution indication as there would be when the rules allow the brakes to be applied at some later period.

The President: This subject is one of very first importance. The signaling systems of our railways hold a very vital relation to their most economical operation. The report of the committee, at this time, I am sure, will be particularly useful. We may have some differences of opinion as to whether we need one or two stop signals, or whether or not we need one or two caution signals, but those are not, perhaps, just the most vital things.

A. R. Fugina: On our road we have many steep hills, and particularly one which is about 10 miles long, and very crooked. We originally installed a signal system provided with only one caution indication. The blocks were a mile long, and the operating officers thought it desirable to have two caution indications to give the engineer the necessary advance information so that he might apply his brakes at two blocks in the rear, for fear he might run downhill at high speed and his brakes fail, and that with only one caution indication he might overrun the signal. In such cases, I believe, a double caution is advisable.

E. G. Stradling (C. I. & L.): I wish to support Mr. Fugina. We have on our road some rather steep downgrade movements, crooked track, where we use the overlap, and I think the conditions of the country through which the road travels would govern a good deal whether you want double caution, or indication, or overlap or not.

Mr. Christofferson: The case I spoke of a while ago, where we used to have a block overlap, was on a down grade track. From experience and observation on that hill, I believe there is less use for an overlap at that point than at any other place, as our trains actually run slower down grade than up.

J. Beaumont: I believe that while the word "desirable" is used in the instructions to the committee rather than the word "requisite," nevertheless, if this association adopted a requisite based upon such instruction, there would be considerable danger in including in our requisites for automatic signal installations something that would make a very unstable foundation.

My object in bringing this point out was because of the fact that you had not stated that overlaps are unnecessary when adequate advance information is provided, but that

overlaps are necessary when it is impossible or impracticable to provide the advance information.

F. L. Dodgson (Gen. Ry. Sig.): I am inclined to agree with Mr. Christofferson. What he says about the restriction of speed on downhill is almost always true on grades of one per cent or over. If the proper distant indication is given I do not think that the overlap is necessary, and if a train runs beyond a certain speed on downhill it does not matter whether there is an overlap or not, the engineer cannot stop the train anyway.

Mr. Stevens: I think that point should be emphasized. A test which we made on the Santa Fe proved that a train running above a certain speed down a certain grade, 1.5 per cent grade, could not be stopped, that the brake-shoes would be melted under the friction.

Mr. Dodgson: That being a fact, are not we liable to bring in an unsafe condition if we put on the overlaps and give the engineer an idea he can stop when he is going faster than he ought to?

A motion by Mr. Peabody that the subject be referred back to the committee was carried.

Mr. Peabody (reading Subject No. 7): The action recommended on Subject No. 7 is that the matter be given full discussion for the information of the committee.

Mr. Stevens: I would like to hear a little discussion as to "Colored and position light signals—reduce the number of failures." My thought is that unless we can go into a minus quantity, I don't know how we are going to describe the reduction in failures due to mechanism. There are mighty few. I think that this meeting can help the committee decide whether we want to go on record—as a practical fact we are not having many failures.

E. L. Watson (P. R. R.): We have on the Philadelphia division an installation of position light signals from Paoli to Overbrook, in the electric zone, and practically the whole of the rest of the division is signaled with T-2, A-C automatics. We have a very good opportunity to compare the performance of the motor signal and the position light signal as far as failures due to all causes are concerned. It is a fact that the position light signals give a smaller percentage of failures than the motor failures. Although the motors do run low, the position light signals are lower. That is a fact, although I can't give the figures.

L. R. Mann (Mo. Pac.): It seems to me that to reduce the number of failures is probably the wrong language to use. It would be better to reduce maintenance. Assume we are not going to have failures in any class of apparatus.

A. G. Shaver (cons. eng.): I am very much in sympathy with the statement made that position light signals and light signals, if it is possible to reduce the number of failures, do reduce them. There is practically none with light signals as near as I can find out, and efficient light signals are, of course, a new development of the signal light system. If I were to prophesy, I would say I believe the time is coming when light signals will very largely replace mechanism signals. It is a logical conclusion that if you have no mechanism you will eliminate failures or trouble due to that cause.

Mr. Peabody: I would ask Mr. Shaver if he does not agree with Conclusion No. 8.

Mr. Shaver: Not altogether. As times will change, the cost of the primary battery will also change. We may witness in the not distant future a material reduction in the cost of power of that sort. If the conclusion is one intended to hold good in normal times I don't know that I can agree fully with it.

Mr. Watson: As to Conclusion 8, it has been developed, I presume the committee did not have that information, although it think it has been given since, that with the primary battery signals lighted, on the approach of the train, where the track circuit is not occupied more than an hour a day, the position light signal is an economical device. I think Mr. Rudd has given that information to the committee, that with the present 500-ampere hour battery, with present prices, from very carefully kept records, signals can be maintained for about $71 a year. With battery material at the old prices it would amount to about $60 a year. Of course, as the traffic increases and as the time the track circuit is occupied decreases, the economy of that decreases.

The President: The question of light signaling is of great interest. As to the relative merits of color and position light signals, presumably there is some difference of opinion. I believe operating officers generally will feel favorably disposed towards the position light signal, but, of course, that is something that will be developed perhaps definitely in the future.

Mr. Christofferson: I don't believe that we will be able to put light signals generally all over for a great many years. If we could use light signals generally all over it would be a fine thing, not so much on account of the trouble that we have in our climate, however, from signal maintenance, but the trouble we have to keep the lights going in very cold weather with the present oil we have. When the temperature gets to 20 below the oil gets very thick and gives poor light, and then we should have the signal of the electric light. But I am afraid if we commence the use of electric signals we would have to introduce a lot of other apparatus that would give us more trouble than the motor itself.

Mr. Watson: We have had no trouble. After the installation I referred to I think there were no failures for a year, except in a few cases. We are satisfied with the reliability and the economy of this proposition, so that at present we are installing 100 of these signals, operated from a primary battery.

Mr. Fugina: Generally I approve the conclusions, but there are one or two points I think it may be well to bring out. The words "where power is available" are used several times. I believe it would be advisable to be more specific. That term is somewhat indefinite. Then there may be some disadvantages with the light signals which it might be well to point out. I refer particularly to the use of light signals in interlocking plants. If we had a small installation we probably could not afford to spend a lot of money to provide all the apparatus that is necessary to assure our having the light available at all times. If we did not have it available, we would have it in condition where we would have no light. With the semaphore signal, if you do not have the light, you still have the signal, and that can be observed by the headlight or will be observed in the daytime. In misty weather or night time the observation could be taken by the engineman. Another point that was brought to my mind particularly by the report of the New York Regional Committee, it is stated "Care must be exercised in the use of reflectors, as these may cause phantom signals due to the trolley headlight or the sun shining through the lens and being thrown back by the reflector, thereby giving a false indication." I presume the committee has given that consideration, but it may be well to point that out in the conclusions.

C. O. Harrington, Jr. (U. S. & S. Co.): I think the suggestion of possible trouble from false indications is merely a matter of the improper design of the signal. An improperly placed reflector may cause a false indication,

but by suitable care the false indication may be said to be absolutely non-existent for practical purposes.

The President: I think, however, Mr. Fugina's question is a practical point. In the light signal, if it is not there, there is no evidence of a signal at all, while in the old semaphore, the absence of a light even at night time is not so vital, inasmuch as the position may be determined by the engineman from his headlight.

Mr. Stevens: I don't think the discussion should stand on that basis, because I think there is evidence of the signal. The signal is there. The men know what it looks like. In the committee's recommendation they state distinctly that the subject has not been sufficiently investigated for the Association to take any action. Practical experience may develop other conclusions.

Mr. Fugina: There are conditions with semaphore signals in which a signal may fail, the light may fail and you can still run on the signal indication. We had a rule that when the signal light is out and the engineman comes to a stop and with the automatic signal he may proceed according to the position of the blade. With the light signal he would have no indication.

Mr. Watson: What is under discussion is the question of having all the lights out, but with the position light signal, if two are extinguished you still have enough remaining to give an indication that may be read.

Mr. Peabody's motion seconded and carried. The committee was discharged with the thanks of the Association.

Committee VI—Standard Designs

THE following outline of work was assigned the committee for this year: 1. Prepare standard designs. 2. Investigate and, if found desirable, revise standard symbols for signal plans.

The committee presented 10 drawings, 4 of which are revisions of previous issues, and 6 of which are new designs, and 1 new specification.

The following revised and new drawings were submitted for presentation to the annual convention for approval and submission to letter ballot:

1095.—Details and Assembly—Multiple Unit Bolt Lock (Revised).

1194.—Details and Assembly—Mechanical Semaphore Bearing (Revised).

1195.—Operating Connections for Mechanical Signals (Revised).

1222.—Details and Assembly—Electric Lamp Box (Revised).

1358.—Bracket for Electric Locks (New).

1394.—Hand Lantern Globe (New.)

1395.—Electric Lamp Box Details (New).

The following new drawings were submitted for discussion in order to obtain information as to the desires of the Association concerning the proposed practices referred to therein:

1365.—Ladders for Ground Mast Top Mechanism Signals (New).

1450.—Location and Support for Highway Crossing Sign (New).

1451.—Location and Support for Highway Crossing Sign (New).

The specification for hand lantern globes was submitted with the recommendation that it be accepted for presentation to the annual convention for approval and submission to letter ballot.

Committee: F. P. Patenall (B. & O.), chairman; J. C. Mock (M. C.), vice-chairman; W. A. Hanert (P. R. R.), C. J. Kelloway (A. C. L.), B. H. Mann (Mo. Pac.), F. W. Pfleging (U. P.), W. M. Post (P. R. R.), M. E. Smith (D. L. & W.), R. E. Trout (St. L.-S. F.); manufacturers' representatives, J. W. Hackett, W. P. Neubert, H. B. Taylor and S. N. Wight.



F. P. Patenall, Chairman

Discussion

Upon suggestion of J. C. Mock, vice-chairman, T. S. Stevens made a motion for the acceptance for submission to the annual convention of drawing 1,095, which was carried.

A motion was also made to accept drawing 1194.

Mr. Stradling: Referring to the semaphore bearing in drawing 1194, we have had trouble in having the casting break at the point in the casting where the stop bolt is screwed in, the bolt being driven out of the casting by the dropping from the upper quadrant of the mechanical home signal, where the stop bolt screws into the casting. It does not exactly strip the threads, but takes out a chunk of the casting with it.

L. F. Howard (U. S. & S. Co.): In cases of that kind where casting are broken, I would like to ask that samples be sent in for analysis, because there may be trouble in the heat as well as in the mechanical design. Some change in the ingredients of the casting might cure the whole trouble.

Mr. Mock: This would seem to be strong enough if the casting was perfect, but in this instance there is a very good chance for the metal to check, be a little too hard, or get blow-holes or something of that sort. If the spring be changed that would be a matter of considerable experiment. We would like to make no change.

J. A. Peabody: Would it not be better to postpone action on this until the May meeting, allowing the committee that much longer consideration? That would not delay final acceptance of this this year, if a change were found necessary.

Mr. Peabody moved that the whole subject be postponed until the May meeting, which was carried.

Mr. Mock: In No. 1195, operating connections for mechanical signals, it has been found that some different lengths of ties and jaws are necessary. This is really an extension of the standard design.

Mr. Peabody moved the acceptance of design 1195, which was carried.

Mr. Mock: Plan 1222, electric lamp box, has been carefully worked over and certain little changes from the box that has been in use have been made. We discussed the question of whether we should make it so it would take a 5⅜-in. or a 5-in. lens, and that complicated the design and made it more expensive. Since the general opinion was that an electric light with 5-in. lens would give fully as good light as a 5⅜-in. lens, we decided to offer just the one design for a 5-in. lens. I move that this drawing be accepted.

Mr. Christofferson: The 5⅜-in. lens is more universally used than the 5-in. lens. While the western roads might not have any use for this device for a good many years, I don't see why this could not be designed so that you could use either the 5-in. or the 5⅜-in. lens. If the eastern roads want to continue this I believe it ought to be designed so that we can use also the 5⅜-in. lens.

Mr. Mock: There is room enough in this casting to provide for a 5⅜-in. lens; that is, the outside dimensions are large enough. I mean a different casting, but this design will suit except for the hole. If you want a 3-in. lens you will have to have another casting. It will be cheaper than to try to put several rings on and always pay for the additional parts. If it is the sense of the association that we ought to have three designs, that would be better than to try to have one to cover all.

Mr. Christofferson: It seems to me, with very little change, this casting could be arranged so that it would hold the retaining rings whatever standard lens is used on the railroad. I don't see why that retaining ring could not be designed so that we could use everything from 5⅜-in. down.

The President: Inasmuch as it would appear that the difference pertains only to the 5 and 5⅜-in. lenses I would like to ask the committee if it would be willing to consider the use of the retaining ring for the purpose of either a 5 or a 5⅜-in. lens?

Mr. Mock: We would be glad to do that. We have that pretty well worked up, and I think we can have the cuts of it at the next meeting.

S. M. Day (Gen. Ry. Sig. Co.): I notice on the drawing no provision is made for padlocking the cover to the body of the lens. I think that is a point that should be covered by the committee. Lots of roads use padlocks on the lamps, because in some cases boys have been known to climb up on the signals and remove the lamps. In many cases we have roads that specify padlocks. The handle is specified as open hearth steel. We would like to see that specified as a commercial handle, a pressed steel handle. Then there is the question of drilling for that handle. As the cover is now arranged you have to drill on an angle, and that means two setups. That could be done with a slight change in the cover. Another suggestion would be to use a plain lamp gasket instead of putty. I notice that this lamp as now designed provides only for a cut-in relay. That means quite a large lamp box and many roads do not use a cut-in relay. If they do not use a cut-in relay, the lamp box can be made smaller and less expensive.

Mr. Mock: I think this box as now presented can be fixed up as to some of the points Mr. Day mentioned. Others may be found to be undesirable because of the use by the roads.

Mr. Day: I would suggest, wherever possible, that all detailed dimensions be left off of these drawings to enable the manufacturers to use their standard practice. Give the dimensions to insure the interchangeability of the device, but don't show the detail dimensions except where necessary.

Mr. Mock: We can't do that and have a construction drawing. That matter has been fully discussed and determined. Interchangeability is quite necessary, and the dimensions for this particular lamp and design are dimensions that are known to be right, because they have been manufactured in this manner. If we leave some off, it is a question where we should stop, and the policy of the committee is to put all dimensions on.

Mr. Stevens: One of the objects of this association adopting standard designs is that, if the railroads feel so inclined, they can put these into the hands of any foundry to make them and have the construction done in their own shops. It appears to me that the general tendency of association designs has been to raise prices. I want to ask if the committee will bear that in mind. Prices are high enough and anything that can be done in the design of apparatus to keep prices down would be advisable. All our committees should bear in mind that the railroads are being charged a very high price for everything they buy and the probability is that those prices are never going back where they started. We should have that vitally in front of us, the reduction of costs, and the elimination of everything from our specifications which will give anybody the chance to charge us more for our work or our apparatus than is right.

Mr. Day: I think the point made by Mr. Stevens is well taken and I have that in mind. Of course, I am looking at this from a manufacturer's standpoint: I think it is very well to recognize, in getting up new designs, existing standards and existing practice so far as possible. I think it would be well to take the present lamp cases on the market into consideration.

Mr. Mock: We want to get a design that is cheap and that will answer the purpose. As Mr. Stevens has said, dimensions are given in detail so that anybody can make it. We have worked up what looked like a good design and our purpose has been to try to get good designs and good apparatus, but we can't control the price.

On a motion by Mr. Mock, plans 1222 and 1595 were referred back to the committee.

J. H. Butridge (I. C.): I would like to move that 1358 be referred back to the committee, with instructions to confer with Committee IV, now working on an electric lock, because this bracket will probably not work in.

Mr. Phinney: Mr. Butridge's committee is trying to design a universal lock and overcome the defects in the present lock. We fear the present lock will not be able to stand, and this support also comes in consideration with the lock. We feel we will be handicapped if this present design goes through.

Mr. Mock: I think that we had better pass to 1365, ladders for ground mast top mechanism signals.

Mr. Stevens: I move its acceptance and submission to the annual convention.

Mr. Christofferson: Is there a railing on the top platform to catch a man in case he should lean back? There is none shown.

Mr. Mock: This is the first time we have asked for the adoption of this as standard. It has been quite a problem to work this out so as to get standard lengths.

Mr. Stevens: Referring to drawings 1450 and 1451, the American Railway Association has a committee appointed to consider the whole field of highway crossing protection. That committee is doing capital work with public utility commissions and highway crossing commissions all over the country, and I believe it is inadvisable for this association to attempt to hamper them by adopting any design for anything connected with highway crossing protection. I therefore move that it be the sense of the meeting that drawings 1450 and 1451 should not be submitted for approval here.

Mr. Mock: The committee did not intend to ask for approval.

The President: The R. S. A. committee is co-operating with the National Board of Railway Commissioners, and possibly in the course of a year will submit a report. In the meantime, designs of this kind would better be held in abeyance.

The President: The motion is that designs shown in numbers 1450 and 1451 be not approved at this time. The motion was carried.

The President: There is a motion before the meeting on plan 1365.

Mr. Mock: There is another thing that I would like to have the association members think about.

We have a good many drawings pertaining to ladders, some of them for mechanical poles and bottom mast mechanism. The committee is of the opinion that the drawing showing these ladders would be suitable for all kinds of mechanisms.

Caleb Drake (C. & N. W.): I would like to ask whether the bottom brace could not be made six feet from the ground to allow a man to pass under it.

Mr. Phinney: In support of Mr. Drake, I will say it is our practice to put relay boxes on the poles. In that case it is necessary for a man to walk under it, and for that reason we found it necessary to go to six feet.

The President: The committee is agreeable to accepting the suggestions made in regard to improvement in plan 1365. With that understanding, what disposition shall we make of the plan?

Mr. Beaumont: There is no reason why we should deliberately introduce anything that tends to increase the hazard of the men. If it seems necessary to change this standard, with a view to clearing a man's head by simply moving the bottom brace up a few inches and respacing the balance of it, that ought to be done.

Mr. Mock: There is another thing I want an opinion on: That is whether this type of ladder ought to be adopted for all masts. The present mast doesn't have a platform.

Mr. Christofferson: When the committee redesigns this ladder, I should like to see that back brace not taken away. I think that ought to be kept on.

This matter was left to the committee.

Mr. Mock: Design 1494 is a picture of hand-lantern globes, and is accompanied by a specification. The committee believes this is a good specification for hand-lantern globes. I move that this design, together with the specification, be accepted.

The President: This report goes back to the committee for further consideration.

Special Committee—Lightning Protection

THE following outline of work was assigned this committee: 1. Prepare requisites for arresters. 2. Recommend location of arresters in circuits. 3. Recommend type and method of applying ground connections. 4. Recommend means of protection other than by arresters.



E. G. Hawkins, Chairman

The committee presented for discussion and criticism under assignment 3, a specification for made grounds for lightning arresters and plan 1424, Lightning Arrester Grounds. A full discussion was requested with a view to presenting a revised specification and plan to the annual convention for acceptance and submission to letter ballot. The committee has given careful consideration to various types of grounds and finds that various roads are using copper plate, iron rod and iron pipe grounds with good success and have adopted them as standard.

The committee has also considered and recommends the following methods for measuring the resistance of grounds which are in general use at the present time:

Method No. 1. Figs. 1 and 2 show the arrangement of connections for measuring the resistance of grounds by the bridge method.

X=ohms, resistance of ground to be determined.

Y and Z=ohms, resistance of two grounds. If not available, to be installed for test.

R=ohms, known resistance.

a and a_1 = distance AC in inches, Figs. 1 and 2, respectively.

b and b_1 = distance BC in inches, Figs. 1 and 2, respectively.

When silence is obtained in the telephone receiver (Fig. 1.), we have

$$Y = \frac{aR}{b} - X \qquad (1)$$

When silence is obtained in the telephone receiver (Fig. 2), we have

$$a_1 (R + X) = b_1 Y \qquad (2)$$

Substitute the value of Y in equation (1) for the value of Y in equation (2), we have

$$X = \frac{(a\,b_1 - a_1\,b)\,R}{(a_1 + b_1)\,b} \qquad (3)$$

Method No. 2.—Fig. 3 shows the arrangement of connections for measuring the resistance of grounds by the voltmeter and ammeter method.

X = ohms, resistance to be determined.

Y and Z = ohms, resistance of two grounds. If not available, to be installed for test.

With connections as in Fig. 3 we are able to determine the resistance R_1 of X + Y from the voltmeter and ammeter readings.

Change connection C to D and determine the resistance R_2 of X + Z in the same manner.

Change connection B to C and determine the resistance R_3 of Y + Z in the same manner.

From the above operations we have the following equations:

$$X + Y = R_1 \qquad (1)$$

$$X + Z = R_2 \qquad (2)$$

$$Y + Z = R_3 \qquad (3)$$

Solving for X we have $X = \frac{R_1 + R_2 - R_3}{2}$ (4)

The committee requested a full discussion of these methods of testing grounds so that they may be resubmitted to the annual convention for acceptance and submission to letter ballot.

Committee: E. G. Hawkins (N. Y. C.), chairman; J. C. Mill (C. M. & St. P.), vice-chairman; J. J. Corcoran (N. Y. C.), L. D. Dickinson (U. P.), G. B. Gray (P. R. R.), T. S. Jobson (G. H. & S. A.), B. W. Meisel (C. & N. W.), W. H. Stilwell (L. & N.), G. R. Cowherd (E. P. & S. W.), C. E. Goings (P. R. R.), K. A. Hinton (C. I. & W.), Stanley W. Law (No. Pac.), J. D. Phillips (P. & R.), Edgar Winans (A. T. & S. F.).

Discussion

Vice-Chairman Mill presented an outline of the report.

R. M. Phinney (C. & N. W.): I would ask the committee why the particular form of bridge shown in the report was selected. I would also ask whether it would not be advisable to give the approximate magnitude of the resistance R, shown in the cut for Method No. 1.

Mr. Mill: It was the thought of the committee that the form of bridge shown was the one usually in use for the induction coil. There was no particular reason why this bridge should be shown exactly as indicated.

Mr. Phinney: Would it not be well to cover that by a note saying, "Any other form of bridge may be used?" In our case we have had better results when we used a battery with direct current and a galvanometer than with an induction coil.

Paul M. Gault (I. C.): As to the committee's drawing of lightning arrester grounds, the taper of the solid ground point is shown two inches long. It seems to me it would be easier to drive if it was three inches long. It is also shown as a cone, and it would perhaps be cheaper to make it of a square section, with the point sharpened, as in the case of a sharpened pencil.

Caleb Drake (C. & N. W.): I may ask if any source of energy would not do in the test shown in the figure for Method No. 2.

Mr. Mill: It was the thought of the committee when considering that point that higher voltage than a battery should be used, that is, a cell or two, but

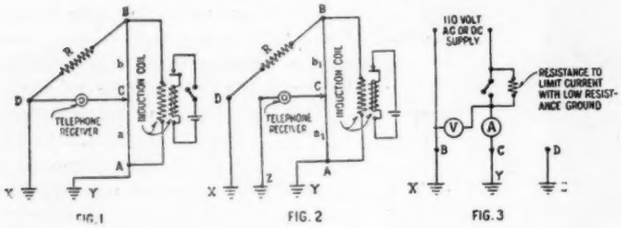


FIG. 1 FIG. 2 FIG. 3

from information we have received since, the committee is willing to recommend 110 volts alternating current or direct current supplied to the battery.

Mr. Phinney: I think that a note should be made in this connection that the readings of the voltage and of the current should be made simultaneously, otherwise the values would not be of use, and also that the committee should determine the approximate resistances to be used there as a guide.

A. G. Shaver: In the specifications for made ground apparatus, section 1, the ground element is specified to be "galvanized iron pipe." I do not see reference made anywhere else in the specification to galvanizing, which may be well done or poorly done, or there may be hot galvanizing or cold galvanizing, and the specification should cover that.

I see nothing to indicate whether the galvanizing is done before manufacture or after. If the galvanizing is done on the rod before manufacture those parts which are exposed to the operations are left bare and are subject to attack by the elements and considerable deterioration in case they come in contact with salt or any similar compound.

With reference to the section on ground points—why rivet in the point? Certainly when it is put in, it will stay there, and I do not think it will come out after it is once put in the ground.

As to the section on ground leads—I doubt the advisability of placing a restriction on the lead to ground. There are situations arising where we had to go a considerable distance to get a good ground connection, and no one will install a ground with a lead longer than is necessary to get the result.

With reference to the drawing showing lightning arrester grounds—I am wondering how the committee expects the fittings to be installed.

Mr. Mill: The committee did not lay out any particular method in driving these rods. The point raised is important. In connection with pipe, we felt it could be driven by taking the terminal screw out and leaving the cap on and in driving the solid iron it would be necessary to devise some cap to go over the screw or terminal to bear on the edges around the terminal on the solid pipe.

S. M. Day (Gen. Ry. Sig. Co.): Mr. Shaver spoke of the galvanized iron pipe. I ask if it is the intention of the committee that the pipe should be galvanized both inside and outside?

Mr. Mill: Outside only.

Mr. Day: In the paragraph under "ground point," could not a commercial buttonhead rivet be used and give satisfactory results?

With reference to paragraph (e), section 11, which reads, "Ground leads above the surface of the earth shall be insulated to protect against personal contact. Magnetic material shall not be used for this purpose." I do not understand the object of that last sentence, unless it is to prevent anyone from getting a shock when he touches the covering of the ground. Is it the intention you should use wick covering or wrapping over the wire?

Mr. Mill: The intent was in case of some magnetic material causing induction or impedence in the ground. It is not to protect against a man driving spurs in and touching against some metallic substance and getting a shock due to the ground lead being in contact with high tension wires.

The President: I presume the committee has confined its suggestions to the designs shown here. There are no doubt other satisfactory designs and those designs would probably require other specifications. This is a proposed standard design.

Mr. Mill: The committee could not undertake to specify and recommend standards for the different kinds and shapes of grounds now being used. Therefore, the committee confined itself to a plate and a pipe, which are more commonly used and are recognized as good grounds.

Mr. Mill: I would like to explain the point in paragraph 11 (c) which has been brought up. The committee investigated, and by calculations made and information obtained it learned that with the wire as specified, longer than 60 ft., in the case of the lead, that dealing with the currents to be taken care of, such as lightning discharges, a longer lead would give so much impedence that the ground would be practically valueless.

A. G. Shaver: I wish to say that I have found from experience that small discharges, such as are capable of blowing fuses of 5 and 6 amperes, and flashing across from one finger to the other of a relay can be with a suitable ground, a ground lead, and suitable lightning arresters, carried to a considerable distance, and all difficulty avoided by having a long lead going to a good earth ground. One of the principal faults I have observed in signal systems, due to lightning trouble, is caused by indifferent grounds.

Mr. Mill: The committee would like to have a discussion on the use of charcoal or salt brine in connection with the ground plate under the heading "Resistance" in section 12 of the report.

Mr. Stevens: I think that would involve local considerations. I feel that perhaps charcoal might be good for some places and salt for others. Out in some of the arid regions in California they had to dig 6-ft. holes and fill them with loose ground so that the first rain, no matter how small a storm it might be,

would be soaked up in that ground quicker than in other places on the prairie. The rain would settle in these holes and they would have a wet ground after the first rain. If you have no moisture, you have not much of a ground. Salt will help you, and charcoal will help to retain the water.

Another point in the problem that has arisen in our work is that of getting a proper ground when you have a long expanse of rock with a thin layer of soil on top of it. It is such a considerable distance to any deep layers of earth that you cannot get to it. We are going to try this year the spreading out of a big expanse of wire netting in this shallow ground. I have learned that the grounds for the wireless telegraph are obtained in this way. We are going to try that scheme for our purposes.

J. E. Saunders: I suggest that this committee get in touch with the committee of the American Electric Railway Association, which has made a considerable study of grounds. As I recollect it, that committee found that the average resistance of grounds is about 8 ohms, and that such grounds were materially benefited for a short time by brine solutions, but not permanently.

Mr. Day: In connection with the committee's further consideration of this subject, I suggest that they refer to Circular 54 of the Bureau of Standards, the National Electrical Safety Code, which has a long article on the different methods of grounds used by different concerns throughout the country.

Mr. Mill: The committee will take the suggestions brought out by the meeting as information and consider them in preparing the report for presentation at the annual meeting.

The committee was excused, with the thanks of the association.

Committee II—Mechanical Interlocking

THE following outline of work was assigned the committee for this year: 1. Report on methods of field construction of mechanical interlocking. 2. Prepare plans for locking switches mechanically at interlocking plants. 3. Prepare plans showing application of interlocking fittings to slip switches, movable point frogs and derails.

A progress report on subject 1 was submitted with the request that it be discussed for the information of the committee, to enable a final report to be submitted at the next stated meeting.



C. J. Kelloway, Chairman

With reference to subject 2, the Association's attention has been repeatedly called to the great variety of front and lock rod fittings for interlocking switches. The committee presented for discussion 11 recommendations and one drawing showing assembly of interlocked switch fittings. This scheme has been carefully tried out for the past two years with most excellent results; as a matter of fact, 1/16-in. locking can be maintained with less expense than 3/16-in. locking with locking schemes generally in vogue. It was requested that the recommendations be accepted for presentation to the annual convention for approval and submission to letter ballot.

The committee reported that it cannot prepare plans showing application of interlocking fittings to switches, slip switches, movable point frogs and derails until the question of front and lock rod fittings has been definitely decided upon by the Association.

Field Construction of Pipe Lines

When laying out a pipe line the selection of a place as free as possible from fixed obstructions such as buildings, bridge girders, abutments, etc., should be given first consideration. The alinement of the pipe line should be straight when practicable. Often by slightly changing the distance of the pipe line from the rail, some fixed obstruction can be avoided and the line kept straight. Where the pipe line follows a turnout, the curve in the pipe line should be gradual instead of following the rather sharp curve of the turnout.

Where the interlocking station building is set back far enough from the tracks so that an additional track may be laid in front of the building at some future time, the pipe line should be installed the standard distance from the proposed track, unless extraordinary expense would be incurred, rather than install the line near the present track and later move it when the proposed track is laid.

In case the pipe line is to be run on a bank, sufficient space should be provided to strongly brace the foundations. In case the line is to be run in a ditch, proper drainage should be provided; also the slopes of banks should be graded or a wall constructed to prevent earth sliding. Pipe lines should not be run under station platforms where it can be avoided.

Where necessary to run pipe lines under ground, as at road crossings, platforms, water tubs and stand pipes, it is recommended that concrete side walls with plank covering be used around the pipe line.

Stakes showing the final elevation of the rail should be accurately driven every fifty feet, then by using intermediate stakes a line should be stretched from which the foundations should be set.

The location of crank and bolt lock foundations should be determined upon first in order that pipe carrier foundations can be so spaced as not to interfere with cranks and bolt locks. Piles should be driven for supporting crank, compensator and bolt lock foundations (and pipe carrier foundations if necessary) where the ground is swampy or marshy. Everything should be done to have the supports for all pipe line apparatus as solid as possible and sufficiently braced to prevent shifting.

For compensation of pipe lines the mean temperature of the interlocking location should be known; in most cases this will be the same as the nearest city and can be obtained from the Weather Bureau station.

Cross pipe runs should not be installed until all supporting pipe carriers are properly spaced and tamped and all tracks are brought to the final elevation and line, which should be the same for all tracks in the interlocking limits.

Crank and compensator foundations should be set to template so that with the crank and compensator arms both normal and reversed the center of the hole in the arm will coincide with the center of the pipe line. Rough

forms should be used for the bottoms of foundations where necessary; finished knock-down forms to be used for the top portion of the foundations. Where foundations are likely to be disturbed by frost, cinders should be placed in the bottom of the foundation hole as well as around the sides, the rough forms to be made of uniform slope and left in the ground.

Concrete for foundations should be mixed at a central point where practicable, from which it can be distributed to foundation locations by track barrows or dollies, or mixed on a flat car which can be pushed from one point to another.

Locking Switches Mechanically

The committee carefully considered methods for mechanically locking interlocked switches. Such locking should prevent a switch from being locked unless the point is tight against the stock rail. In order to accomplish this, the stock rails must be held rigidly in place and the switch points fitted to No. 1 switch rods and front rods of types which will reduce to a minimum the rolling of the switch points with an obstruction between the point and the stock rail. Therefore, not only the locking attachments, but also the No. 1 switch rod and the general installation of the switch must be taken into consideration. The committee made the following recommendations:

1. That switches be designed for use of riser plates of uniform thickness, drilling of switch points to be 25/32 in. diameter and spaced 2½, 5, 5, 5 in. centers.

2. That the No. 1 switch rod be so designed as to reduce to a minimum the rolling of the switch points when power is applied to the rod and with an obstruction between the ball of the stock rail and the switch point, and that lost motion between it and the switch point can be taken up. That the switch lugs to which the No. 1 switch rod is attached shall have 25/32x2 9/32-in. slotted holes, spaced 5 in. between centers and attached to the switch points with ¾-in. bolts.

3. That not less than 3 steel gage plates shall be used for each switch, slip and point derail, 1 plate on point tie and 1 on nearest tie on each side; not less than 4 gage plates for each set of movable point frogs, 1 on point tie and 1 on first tie back of each pair of points. Gage plates shall be not less than ¾x6 in. and switches must be put to gage before gage plates are installed.

4. That substantial, adjustable rail braces shall be used on all gage plates.

5. That switches shall be so installed that the switch points fit up properly to the stock rails and operate freely.

6. That the front rod shall be without pin connections and designed to reduce to a minimum the rolling of the switch points when power is applied to the switch and with an obstruction between the ball of the stock rail and the switch point. Point lugs shall have 25/32x2 9/32-in. slotted holes, spaced 5 in. between centers and attached to the points with ¾-in. bolts.

7. That the lock rod shall be of the double adjustable type and connected to a ball joint lug in the center of the front rod by means of two 1¼-in. cup nuts, and two 1¼-in. standard nuts. The notches in the lock rod shall not be more than ⅛ in. greater than the plunger, measured in a horizontal line.

8. That the f. p. lock plunger shall be rectangular, ¾x2x19 in., placed horizontally in the plunger box with a sliding fit.

9. That the plunger box shall be placed 2 ft. 6 in. from center of box to gage of rail and shall be mounted on a ½x6-in. steel plate, supported by three ties and securely bolted thereto with ¾-in. bolts.

10. That the switch and lock movement shall be designed for staggered locking or its equivalent; locking dog shall have not less than ½x2-in. locking surface, placed horizontally.

11. That the switch and lock movement shall be placed not less than 2 ft. 6 in. from center of movement to gage of rail and shall be mounted on a steel base plate, supported by not less than three ties, except electrically operated switch and lock movements which shall be supported by not less than two ties, and securely bolted thereto with ¾-in. bolts.

Committee: C. J. Kelloway (A. C. L.), chairman; Samuel Miskelly (C. R. I. & P.), vice-chairman; F. E. Whitcomb (B. & A.), vice-chairman; Larsen Brown (A. T. & S. F.), G. W. Chappell (N. Y. N. H. & H.), O. H. Eichblatt (So. Pac.), Oswald Frantzen (N. Y. N. H. & H.), J. W. McClelland (P. & R.), W. B. Morrison (D. L. & W.), E. K. Post (P. R. R.), Chas. Stephens (C. & O.), E. C. Carrol (C. & N. W.), Wm. Dawson (N. Y. C.), C. S. Foster (P. R. R.), H. F. Lomas (I. C.), E. E. Mack (C. & E. I.), H. B. Pflasterer, E. J. Relph (N. P.), J. I. Vernon (N. Y. N. H. & H.), and W. F. Zane (C. B. & Q.).

Discussion

F. E. Whitcomb: The committee desire to present as a progress report the report on field construction of pipe lines.

R. M. Phinney (C. & N. W. Ry.): I would like to know if the committee intended to leave out the use of oil pipes. It refers to the running of the pipes underground.

L. R. Mann: Under field construction of pipe lines it says, "The alinement of the pipe line should be straight when practicable." I thought the committee might give us, after consideration, just what their thought was on the maximum curvature. It says, "Where necessary to run the pipe lines underground, it is recommended that concrete side walls with plank covering be used around the pipe line. I thought in this discussion it might be brought out that between ties not over a certain number of pipes should be run.

Mr. Whitcomb: The committee did not at the time that this report was gotten up determine any maximum or minimum degree of curvature, but we will be glad to give that consideration.

C. A. Christofferson (N. P.): I had occasion two years ago to put in a heavy pipe line around a 12-deg. curve and I fould that did not work very good. I finally came down to an 8-deg. curve. I believe that is something the committee could spend a good deal of work on with profit.

The President: On the Metropolitan Elevated in this city there are interlocking plants where the pipe lines are curved 90 deg. in a comparatively short distance. I suppose that would have to be considered as the extreme case. Perhaps Mr. Christofferson would be prepared to suggest to the committee the proper maximum curvature around which a pipe line may be properly operated.

Mr. Christofferson: I had to put in an extra pipe line on the 12-deg. curve in order to operate the pipe line. That is the heaviest curve I ever put a pipe line on.

In regard to the fourth paragraph, I think the committee should reconsider that and change the paragraph entirely. The question was brought up a while ago about oil pipe and stuffing boxes. I think most of us have found that we get the best construction by putting the pipe inside of a crude oil pipe at crossings and places of that kind. I believe that should be recommended. We might say, if proper drainage could be provided, this construction might be used. I believe the whole paragraph should be reconstructed.

Mr. Whitcomb: This paragraph was designed to cover

situations where it was necessary to take an entire big pipe line, run it across a street where cranks and compensators might also be located in the crossing.

Mr. Christofferson: There might be such places, but very few. I believe if a compensator or a crank is put in a street crossing it should be put in oil boxes or boxes provided for that, cast iron boxes, to put the crank and compensator in.

L. R. Mann: If the field construction of pipe lines is again submitted for final adoption, on paragraph 4, as it is, it would lead one to believe that this is the only method approved by the association for taking pipe lines underground. It is my thought that the committee would include all of the approved methods.

Mr. Whitcomb: We would be glad to do that.

A. G. Shaver (cons. engr.): I would ask if the placing of the compensator and crank arms is to be arranged so as to throw the deflection of the pipe line on one side, that is, beyond the center.

The President: I do not think that is the purpose of the committee. That might be indicated from the matter as printed. Certainly, the committee intended that only one-half of the strength will be used on either side of the center.

T. S. Stevens (A. T. & S. F.): I question very much whether the emphasis placed on the desirability of mixing at a central point is good. You are bound to get a little set in taking the concrete from the central point to the foundation, whereas if it is mixed close to the location the setting would not take place until the concrete was in position.

The President: It is suggested that that method presupposes the use of a concrete mixer.

Mr. Whitcomb: That was the intention, and it is stated that the use of a mixer was desirable and economical.

Mr. Stevens: There is one thing which occurs to me in looking over the plan submitted for these specifications, and that is that about the only things included which we are now using are the ties and the lockrod.

The President: The committee is in somewhat of a quandary. The instructions state, "Prepare plans for locking switches mechanically at interlocking plants." Until we arrive at standards in the way of detail parts, it was, of course, necessary that the committee should make certain suggested designs. We will have to work up designs in detail for just such appliances finally, but the plan as a whole may well be considered, and we will just forget the specific design shown.

Mr. Stevens: We cannot forget the design as shown. That is the trouble. The particular apparatus used calls for certain offsets in rods which appear to us to be unnecessary, but which may be necessary with regard to the special apparatus involved.

I fail to see why it is not possible for this committee to design a switch layout and take into consideration the standards that this association has already adopted.

The President: Mr. Stevens' points are very well taken.

J. C. Mock (M. C.): I think the purpose of this exhibit is to show the application of a particular design. We all know that the switch layout can be arranged for a single switch on a great variety of designs, as Committee VI has already shown in its report submitted to the association several years ago.

Mr. Whitcomb: Committee II was instructed to "prepare plans for locking switches mechanically at interlocking plants." The first thing we got up against was to find some way of holding the switch rail in its position so that it would not tilt with an obstruction in the point. The members of the committee immediately began experimenting with various kinds of locking rods and various kinds of front rods which would prevent the point from tilting. About a dozen different types were tried out and it was found that a front rod designed substantially after this pattern would hold the point from tilting the best of anything we could find. We also found, in order to maintain our adjustments, that it was necessary or desirable to provide adjustable rail braces. Therefore, this plan was not drawn up as a standard.

The President: Committee II cannot make drawings which the association will accept until Committee VI has proceeded further with its work. However, drawings submitted in this way have a value and I have no doubt will be considered by Committee VI in its work on the details.

R. M. Phinney (C. & N. W.): I notice that it is stated the lock plunger shall be rectangular, whereas the association has a standard plan which shows a circular plunger.

Mr. Whitcomb: It was the committee's recommendation that the rectangular or flat plunger be used, instead of the round plunger, as then the same lock rod could be used with or without a switch and lock movement.

Mr. Mock: As to the use of a square as against a round plunger, which is the present standard, I am not sure it has been discussed in meetings, but the matter has been discussed extensively in committee. If anything is adopted as a standard, it should stand until it is proven to be unreliable or unsafe, or that there is something which is a good deal better. I would like to know how much better a square plunger is from the standpoint of safety and efficiency than the round plunger. The round plunger is a cheaper manufacturing proposition. Are we warranted in going to the more expensive construction and design to get the square plunger?

J. E. Stephenson (Gen. Ry. Sig. Co.): I am not interested in this matter from the railroad standpoint, but if we are going to stick to established practice in all cases, we are not going to advance, and I do not think that the committee should be required to stick to standard practice in making recommendations.

Mr. Whitcomb: I have found in actual experience that a square plunger and with this type of rod we have been able to maintain much closer locking than we did with the round plunger. I am not prepared to say that it is all due to the square plunger by any means. It may be the combination.

B. T. Anderson (D. L. & W.): The type of front rod and plunger shown by the committee has been in service on eight or nine of the interlocking plants on our road for over a year, and has given very satisfactory service. One of these front rods was tried out for a year before it was installed in any number of plants, and our mechanical men and supervisors are in favor of the front rod and square plunger, and we expect to change all of our equipment to that type as the older plants are renewed.

Mr. Whitcomb: The committee would like some discussion on the spacing of drillings on switchpoints.

Mr. Mock: The American Railway Engineering Association has adopted a drilling 1.5, 5, 3, 5 and 5 in. That is the drilling we have been using in our layouts. I do not know what the objection to it is. I would like to know what advantage there is in having uniform drilling of five inches after the first hole in the point over the one that has been in use.

The President: It would seem to be desirable that this association should adopt the bolt spacing established by the A. R. E. A.

Mr. Whitcomb: The main thing in the 2.5 in., as the location of the first hole, was that with only 1.5 in. between the point and the first hole, it left practically no

room to put in a wrench to tighten up the bolts for the front rod.

The President: I believe the members here would like to dispose of this question rather definitely for the benefit of the committee. In view of the fact that there is an accepted standard as established by the A. R. E. A. for the bolt spacing on switchpoints, unless there is an objection more substantial than the one set up by Mr. Whitcomb, it would seem to be proper for this meeting to perhaps offer a pretty strong suggestion to the committee.

Mr. Christofferson: If the drilling of the switchpoint has been adopted by the A. R. E. A. I think we should follow their practice. No doubt they have given considerable thought to it. We cannot go back on what the signalmen recommended at that time, and change to something else.

The President: Will the committee be willing to consider and use the bolt spacings as approved and established by the A. R. E. A.?

A. W. Stewart (A. C. L.): I understand this has something to do with the slotted holes in the point locks.

Mr. Whitcomb: The idea of drilling it back 2.5 in. is that where the slotted hole is supplied in the switch foot that the front rod does not project out beyond the switch

C. M. Duffy (C. R. I. & P.): I do not believe that moving the hole back an inch would interfere seriously with the standards adopted by the A. R. E. A. It has no connection with the hand-thrown switch. It is merely riveted and reinforced.

Mr. Stevens: I am inclined to agree with Mr. Duffy. I do not believe that if the committee can demonstrate that there is a necessity for this change that the A. R. E. A. would offer any very serious objection to it, and I think they would be very thankful for the information.

The President: Until we have approached the A. R. E. A. and asked them to change the standard now accepted, it would seem inconsistent for this association to come out with a second recommended practice at variance with the one now in effect.

Mr. Mock: I think the committee has in a few words said just what the reason was for that change in drilling. This design of front rod bent over the end closes up the room for turning the nut. The designs that have been considered up to this date, I think do not have the end blocked off, you might say. Therefore, there was a free end in which the wrench could turn the nut.

This being the first time this design has been presented to the association, it might be well to call this matter to the attention of the committee on Track of the A. R. E. A. and ask them if they will not consider a change of the drilling.

Mr. Whitcomb: So far as we have experimented we have found that this was the rod which gave us the most rigid construction and enabled us to keep the point in its place the best. When applying that type of rod and lug it would be much more readily and easily applied with the drilling moved back another inch.

The President: It would seem that the committee should not submit to the association as standard a drilling at variance with the established standard. The question is, shall we take this matter up with the A. R. E. A.?

A motion by Mr. Stevens that the report be received as information was carried.

J. Beaumont: With regard to the first item under "Locking Switches Mechanically," I would like to know whether it is a requisite or an assurance. It says "that switches will be designed for use of riser plates of uniform thickness."

The President: The question raised by Mr. Beaumont is important. I should say that the committee has not authority to go into the general question of the design of switches or frogs. It is, however, I should say, distinctly within the function of this committee to go into the making of detailed drawings on switches and frogs.

The President: That would not be so much a question of the possible prevalent practice among the manufacturers, as it would be a question which would deal directly with standards accepted by the A. R. E. A., if they are the accepted standards of the railways, and I believe they are, I ask the committee if they will bear in mind the points brought out here this morning, with particular reference to the question raised by Mr. Beaumont.

The committee was excused with thanks.

Report on Harmonizing of Specifications

THE following outline of work was assigned this committee: 1, Harmonize the wording in the several specifications now in the manual, where such wording on the same subject is at variance. 2, Recommend any changes or additions necessary to make complete any unit specification or major specification.

In the interest of uniformity, the following guide was submitted for use by all members when submitting literature: Use "may" in optional cases; "should" in desirable cases; "shall" in imperative cases in specifications and requisites; "must" in imperative cases in rules and instructions; "will" where reference is made to the purchaser's responsibility.

The committee recommended that the chairmen of the several committees interested in the subject of "Guaranty," covered by Section 8 of the General Provisions, agree in such manner as they may mutually concur, upon a recommendation as to the wording for such a section and submit same to the stated meeting in June, 1917.



H. S. Balliet, Chairman

The committee recommended a new paragraph, to be known as (c) under General Provisions, Section 1, title, "Purpose." This is due to a recommendation to this committee for consideration of certain detail by Committee III:

"Where blanks have not been filled in indicating the purchaser's requirements or where an option is permitted and the purchaser has not expressed his preference, the contractor's recommended practice shall be followed." 1917.

The committee submitted a large number of recommendations for harmonizing the Detail Provisions, with the request that they be accepted at the stated meeting for presentation to the convention for approval and submission to letter ballot.

Committee: H. S. Balliet (G. C. T.), chairman; G. H. Dryden (B. & O.), W. H. Elliott (N. Y. C.), R. B. Elsworth (N. Y. C.), E. G. Hawkins N. Y. C.), R. C. Johnson (B. R. T.), C. J Kelloway (A. C. L.), W. N. Manuel (G. R. & I.), C. H. Morrison (N. Y. N. H. & H.), F. P. Patenall (B. & O.),

J. A. Peabody (C. & N. W.), G. S. Pflasterer (N. C. & St. L.), C. C. Rosenberg (R. S. A.), T. S. Stevens (A. T. & S. F.), E. G. Stradling (C. I. & L.), F. B. Wiegand (N. Y. C.).

Discussion

The meeting first took up the detail provisions.

John Roberts (Gen. Elec. Co. by letter): If this specification is allowed to stand it will rule out a great many motor-generator sets, such as we have been building and recommending for a number of years. These sets are herein listed up to 9.65 k.w. for charging 110-volt storage battery and are made even larger in this construction. We find this is more efficient, cheaper and more economical in spacing than a 3-bearing or 4-bearing set requiring a sub-base and would, therefore, like to see this clause stricken from the specifications as we cannot see any definite reason for it.

J. E. Saunders (U. S. & S.): It seems to me that the paragraph on "Machines" limits them to the electro-mechanical class. If it is to be general, it should have included electrical and pneumatic, and the heading should be reworded. I suggest also that there is no limit in the paragraph on "Locking," in which you provide a locking shaft with one cross-locking bar and one longitudinal-locking bar. In the machines above 40 levers, mechanical, or 60 levers, power, that is not required, and in some large machines that cannot be furnished. I believe the committee should give the limit in which they require the different parts, the limit in the number of levers. It is not now practicable.

Walter P. Neubert: Referring to the paragraphs (a) and (b) on "Down Rods," one says "One jaw of each rod shall be offset one-half inch,' and the other says, "Down rods shall have upper jaws offset one inch." I can understand the reason for the one-inch offset, but do not just see where the reason for the one-half inch offset comes in. It seems to me that should be combined in one paragraph.

R. M. Phinney: In the section on "Compensators," I believe the amount of compensation to be allowed for pipe installed in oil pipe should be given in the specification.

James H. Cormick (Can. Nor.): We have several situations where we have 500 ft. of oil pipe, and we have no trouble whatever in operating the signals without any compensators.

Mr. Stevens: I think perhaps where you get only moderate changes it will not affect the pipe in the 2-in. pipe, but when the weather is very cold I think it affects it.

Mr. Cormick: We had 60 below zero this winter and we had no trouble.

Mr. Stevens: You adjust with a screw jaw?

Mr. Cormick: Yes, but we have had very little adjustment to do.

The committee was dismissed with the thanks of the association.

Committee VII—Direct Current Relays

THE following outline of work was assigned this committee: 1. Prepare relay specifications. 2. Recommend minimum allowable drop-away point of relays of various resistance in service.

The committee submitted reports on the following subjects: 1. Winding of relay coils. 2. Recommended resistance of track relays. 3. Track circuit data forms.



E. G. Stradling, Chairman

Winding of Coils

It is probably not understood by all that a relay to be most efficient should have its coils fully form wound with the specified size of wire. Tables are given herewith which were computed by two relay manufacturers showing the exact resistance secured by the use of different gage wires. These tables also show the pick-up and drop-away in amperes for standard R. S. A. four-point relay. The values shown in these tables are secured in a laboratory test according to R. S. A. specifications. (See page 492.)

The committee recommended that these tables be accepted for presentation to the annual convention to be submitted to letter ballot so that they may be placed in the Manual.

Recommended Resistance of Track Relays

It is the opinion of the committee that where the recommended limiting resistance is used in series with the battery for track circuits a relay having two ohms resistance is more economical and generally safer than a four-ohm relay installed under similar conditions. The two-ohm relay has the following advantages over the four-ohm relay:

1. Less energy consumption.
2. Equally good protection against a broken rail.
3. Less susceptible to stray current from adjacent battery.
4. Will operate with a higher shunting resistance across the rails.
5. Has better operating qualities when track conditions are adverse to maintaining a track circuit.

When foreign current is present on a track circuit it should be given special attention in view of the following statements:

1. When a rail or battery lead is broken and the track circuit is shunted, the two-ohm relay will be more susceptible to foreign current than the four-ohm relay under the above conditions; but with the track circuit not shunted, the two-ohm relay will be more readily picked up by foreign current only when that foreign current enters the track circuit through a resistance that is less than six ohms.

2. When the two-ohm relay is used, the length of the track circuit can be increased and this can be done safely if there is no foreign current present; however, if there is foreign current present, the two-ohm relay on the extended track section will receive more current from the combined foreign current and track battery current than will a four-ohm relay on a proper length track section which has not been extended.

3. Considering track sections of equal length and with other conditions equal, except that the proper recommended minimum limiting resistance for the respective relays is used in series with the track battery, then the two-ohm relay will in general be less susceptible to foreign current than the four-ohm relay.

The committee recommends the adoption of the two-ohm relay by the Association.

Union Switch & Signal Company

Resistance at 70° F. per pair of coils	Size of wire Gage B. & S.	Diameter	Pick-up	Drop-away
2	16	.0508	.105	.050
3	17	.0452	.087	.041
3.8	..	.0420	.078	.037
4 9	18	.0403	.0/2	.034
7.6	19	.0358	.0545	.026
10.5	20	.0319	.0475	.023
16.2	21	.0284	.0386	.0182
24.2	22	.0253	.0314	.015
38	23	.0225	.026	.0125
57	24	.0201	.023	.0098
83	25	.0179	.0185	.0087
136	26	.0159	.0145	.0068
212	27	.0141	.0122	.0058
326	28	.0126	.0096	.0046
558	29	.0112	.0076	.0036
994	30	.0100	.00535	.0025

General Railway Signal Company

Resistance at 70° F. per pair of coils	Size of wire Gage B. & S.	Diameter	Pick-up	Drop-away
1.9	16	.0508	.103	.050
3	17	.0452	.087	.041
4	18	.0403	.078	.036
7	19	.0358	.059	.027
11	20	.0319	.047	.021
16.8	21	.0284	.040	.018
25.5	22	.0253	.033	.016
39	23	.0225	.027	.012
57.5	24	.0201	.023	.010
96	25	.0179	.018	.008
136	26	.0159	.015	.007
210	27	.0141	.013	.006
300	28	.0126	.011	.005
430	29	.0112	.0096	.0045
670	30	.0100	.008	.0035
1000	31	.0089	.007	.003
1500	32	.0079	.006	.0025

Track Circuit Data Forms

The accompanying forms, showing report of ballast resistance test, report of rail resistance test and report of insulated joint test, are recommended for securing data for computing track circuit values.

Committee: E. G. Stradling (C. I. & L.), chairman; James Anderson (N. Y. C.), vice-chairman; E. T. Ambach (C. H. & D.), B. H. Ayers (L. & N.), D. M. Case (Southern), A. W. Fisher (P. R. R.), A. R. Fugina (L. & N.), E. W. Kolb (B. R. & P.), H. W. Lewis (L. V.), A. E. Pratt (Erie), C. F. Stoltz (C. C. C. & St. L.).

Discussion

E. G. Stradling (chairman): First I would like to take up the tables under "Winding of Coils."

Mr. Phinney: Comparing this with the manual, I notice these are four-point relays. Two-point relays have different charactertistics. I would like to ask the committee why they left off the working current given in the manual.

Mr. Stradling: We got the information in these tables from the manufacturers. If it is the desire of the association to have working current we can probably secure that from the manufacturers also and put it in.

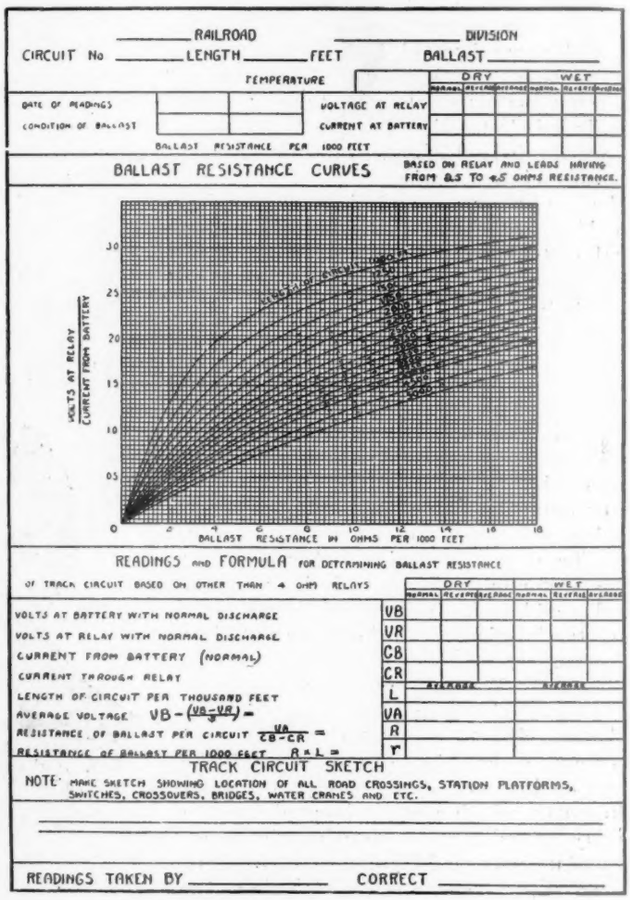
Mr. Harrington: If the committee desires to put the working current in, all they have to do is to use the working proportions between pick-up, drop-away and working current now used in R. S. A. specification, and the working current can be worked out from these tables.

Mr. Stevens: We have made it a practice not to put in the manual anything which could be varied from by the manufacturer without consulting this association, not with the intention of not accepting the manufacturer's standards, but because we haven't control of the situation.

Mr. Stradling: Committee VII called upon all the manufacturers of relays to submit tables, and we hope to have all the tables ready for the June meeting.

Mr. Day: In connection with the table it seems to me it would be desirable to give information as to the insulation of the wire.

Mr. Stradling: There was no consideration given to the insulation. We have been called upon at various times by signal engineers and others to devise pick-up and drop-away for relays having other resistance than the 4-ohm specified in the R. S. A. specification, and this table was one of the things that served the purpose of information.



Report of Ballast Resistance Test

Mr. Vandersluis: In order to specify resistance we would have to know exactly what we are going to get in the way of covering for the wire.

Mr. Harrington: In preparing this table of resistance of different relays, we did not proceed on the basis of the coils which we are now furnishing, because at present we are being compelled to furnish coils to a specific resistance, 250 ohms, 500 ohms, 1,000 ohms.

The President: I would like to know whether either the committee or the manufacturers believe it would be desirable for this association to have a specification for the covering of wires used in relay coils?

Mr. Stradling: The committee now has this under consideration.

Mr. Stevens: I move that it is the sense of the meet-

ing that these tables be received as information and be included in the proceedings. Carried.

Mr. Stradling: The next question is the recommended resistance of track relays.

Mr. Vandersluis: We have a table of statements which undoubtedly are all facts. We have no proof presented, however. It is my understanding that field tests

RAILROAD_____ DIVISION_____ DATE_____
NO OF TRACK CIRCUIT_____ POLARIZED OR NEUTRAL. NO. OF JOINT_____
KIND OF JOINT_____ KIND OF INSULATION_____
CONDITION OF JOINT_____ WEATHER_____
OBSERVERS_____

METERS USED	SCALES	RESISTANCE OF EACH SCALE	RESISTANCE OF CONNECTIONS FOR AMMETER_____ POLE CHANGER_____

READINGS AT JOINTS 1 AND 2 "J" END OF CIRCUIT.

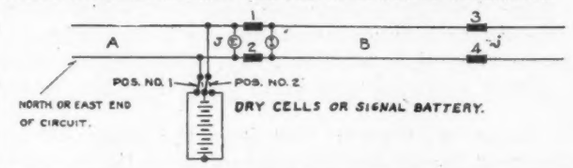
	POS. NO. 1	POS. NO. 2	RESULTS
E			
I			

READINGS AT JOINTS 3 AND 4 "J" END OF CIRCUIT

	POS. NO. 1	POS. NO. 2	RESULTS
E			
I			

NOTE: REMOVE BATTERY AND RELAY FROM SECTION B AND CONNECT AMMETER BETWEEN RAILS CLOSE TO JOINTS. CONNECT THE BATTERY CELLS TO SECTION A, THRU A POLE CHANGER AS SHOWN AND CLOSE TO THE JOINTS. MEASURE VOLTAGE E ACROSS RAILS OF SECTION A CLOSE TO JOINTS AND CURRENT I THRU AMMETER. REVERSE POLE CHANGER AND REPEAT READINGS. NOTE RESISTANCE OF CONNECTING WIRES FOR BOTH BATTERY AND AMMETER. WHEN THESE READINGS HAVE BEEN TAKEN FOR ONE END OF SECTION A, REPEAT FOR JOINTS ON OPPOSITE END. NUMBER ALL JOINTS AS PER SKETCH. RESISTANCE OF JOINTS TO BE COMPUTED BY OHMS LAW, $I=\frac{E}{R}$. OR, $C=\frac{I}{R}$.

WHEN NORMAL AND REVERSE CURRENT READINGS THRU I SHOW AVARIATION EXCEEDING 25% THIS TEST WILL NOT BE ACCURATE.



FORM TO BE LETTER SIZE, 8½ x 10¾

Report of Insulated Joint Test

have not been made to substantiate these statements. The matter is of enough importance to have it presented at the next stated meeting, with such facts as the committee have to support these statements. They can give us their theoretical deductions.

Mr. Stevens: Somebody stated that this association adopted a 4-ohm relay. I question that statement. I believe all our literature points to the fact that a 4-ohm relay is the proper thing to use on the track circuit, but I don't remember that the association ever took formal action with reference to that resistance. That fact should be developed very conclusively before we take any affirmative action. I shall begin to make tests with relays of 2-ohms resistance to some extent as soon as I can get the relays.

Mr. Day: I would suggest that you give the temperature in degrees Centigrade instead of degrees Fahrenheit, as that is standard practice at present, and also the gage in the terms A. W. G.

Mr. Vandersluis: I thought this matter was important enough to give the association such proofs as the committee have. I understand it is all theoretical proof, but I think the association ought to have that proof presented to it.

A. W. Stewart (A. C. L.): We recently sent some 4-ohm relays to the factory to be worked over and made into 2-ohm relays. Where we could not operate a 4-ohm relay successfully with caustic soda batteries connected in multiple we are operating them now without any resistance, and with from 0.7 to 0.9-ohm external resistance. I had some coils made to suit a certain type of relay, 2-ohm, 3-ohm and 4-ohm, and on the same day I have tested the same relay on the same track circuit with the various coils, and my experience has been such as to lead me to believe that a 3-ohm coil is better than the 4-ohm coil. I refer to battery consumption and everything else.

T. S. Stevens: One reason why I would like to see the recommendation modified is that I do not want to see the 2-ohm relay knocked out. The association should recognize the 2-ohm relay as being a proper thing to experiment with, and I am quite certain we will kill it if the recommendation goes as broad as this to the annual convention and to letter ballot.

A. R. Fugina (L. & N.): This is not a broad recommendation, but a recommendation for a relay to be used where we use limited resistance in circuit with the track battery. The impression seems to prevail that these conclusions were derived from laboratory tests. We had the same factors of safety which have governed in operating the 4-ohm relay and applied them to the 2-ohm relay. It is not laboratory work, but actual figures and deductions.

E. C. Carrol (C. & N. W.): I will ask if Mr. Stewart has had any experience with foreign current on his track?

DIVISION_____
CIRCUIT_____ LENGTH_____ TEMPERATURE_____
POLARIZED OR NEUTRAL_____ NO. OF BOND WIRES PER JOINT_____
KIND OF BOND WIRES_____ LENGTH OF BOND WIRES_____
AGE OF BONDING_____ WEATHER_____
WEIGHT OF RAILS_____
NUMBER OF RAILS_____
VOLTAGE ACROSS RAILS_____
NUMBER OF RAILS_____
VOLTAGE ACROSS RAILS_____
NUMBER OF RAILS_____
VOLTAGE ACROSS RAILS_____

TRACK CIRCUIT SKETCH

SHOW ON TRACK DIAGRAM LOCATION OF ALL INSULATED JOINTS, SWITCHES RAILROAD CROSSINGS, ROAD CROSSINGS, STATION PLATFORMS, BRIDGES, ETC.

READINGS A AND B TO BE TAKEN SIMULTANEOUSLY WHILE TRACK SECTION ADJACENT TO BATTERY END OF SECTION BEING TESTED, IS SHORT CIRCUITED, AND WHILE A SHUNT OF NOT GREATER THAN .05 OHMS IS ACROSS THE RAILS OPPOSITE THE RELAY ON THE SECTION BEING TESTED. READINGS A AND B TO BE TAKEN WITH BOTH POLARITIES OF CIRCUIT. USE THE AVERAGE IN CALCULATION

POLARITY OF BATTERY	NORMAL	REVERSE	AVERAGE
A – VOLTAGE ACROSS RAILS – BATTERY END			
B – CURRENT FLOW FROM BATTERY			
L – LENGTH OF CIRCUIT IN 1000 FEET			

RESISTANCE OF RAILS PER 1000 FEET OF TRACK = $\frac{A}{BL}$ =

OBSERVER_____ DATE_____

Report of Rail Resistance Test

Mr. Stewart: We do not have much foreign current on our railroad.

Mr. Fugina: I stated a short time ago that the relay manufacturers and the railway members were agreed on this specification. I want to include in that also the battery manufacturers, both of high-voltage and low-voltage caustic soda battery.

J. C. Mock (M. C.): It seems to me that when half of the total resistance is in the coils you have much more chance for variables in the balance of the circuit. It

would seem safer, in my opinion, to have most of that resistance in the coils. Then the maintainer cannot go around and make a change in his resistance when it rains and before he gets away the sun shines and the weather conditions dry up and you get totally different track conditions. We have a great deal of brine due to the traffic over our road, and I am afraid of that condition, notwithstanding all these points which have been mentioned. I think the relay should be safe when all the resistance is out. I doubt very much if we can have all the conditions desired in a 2-ohm relay in actual practice. There are conditions you cannot reproduce in a "toy railroad."

H. G. Morgan (I. C.): I think Mr. Mock is mistaken in regard to the differentiation between the resistance and relay coil. That is just as important with the 4-ohm relay as the 2-ohm relay. The important place to have the resistance is in the battery end, and in the old type of battery you had it in the battery. In the new type you have to have it outside, no matter what relay the association adopts.

J. E. Saunders (U. S. & S.): I would like to call the committee's attention to the apparent contradiction between clause 3, where it says: "Less susceptible to stray current from adjacent battery" and subdivision 1 in clause 5 just below.

C. O. Harrington, Jr. (U. S. & S.): Does not clause 3 mean that the 2-ohm relay is less susceptible to current entering the battery through insulated joints? If clause 3 is intended to mean that the 2-ohm relay is less susceptible to current passing through insulated joints from adjacent batteries, I think it is true, but the conditions are not exactly parallel to foreign current.

Park B. Hyde (Thos. A. Edison Co.): It is my understanding that the first five statements are general as to the advantages of 2-ohm relay, and the matter which follows is in the form of exceptions to these five statements, which exist only when there is foreign current from any source. The 2-ohm relay is less safe than the 4-ohm relay for these foreign currents.

B. T. Anderson (D., L. & W.): I question the accuracy of the first statement: "Less energy consumption." I believe the committee should tell us under what conditions that is true. We can conceive of a track circuit on which a 2-ohm relay would operate better than a 4-ohm relay, that is, where the ballast conditions are bad you will have a lower voltage at the relay and it might be possible for a 2-ohm relay to operate better than a 4-ohm relay.

S. M. Day (Gen. Ry. Sig. Co.): I think that that third paragraph can be worded more clearly by having it read: "Less susceptible to a given leakage current from adjacent battery through insulated joints."

F. L. Dodgson: All these calculations and trials of the one relay and the other which the committee and myself have made have involved nothing except Ohm's law. If our arithmetic is right and Ohm's law is correct, then our deductions must of necessity be correct. As to my "toy railroad," perhaps I cannot reproduce the varying conditions found in practice on track circuit, but I can be sure that the conditions which I do produce will stay the same while I make my test, and that is a thing you cannot do on the track circuit on the open road.

There is no advantage to any of the manufacturers of relays in furnishing a 2-ohm as compared with a 4-ohm relay. As a matter of fact, the 2-ohm relay costs more than the 4-ohm. We went into this with the thought that we could do some good to the signal fraternity in giving them a relay for use with a caustic soda battery, and that is the only reason the committee had in recommending the 2-ohm relay. The committee is unanimous that the 2-ohm relay, all things considered, is a safer relay, operating satisfactorily under more adverse conditions than the 4-ohm relay.

Mr. Stevens: I move that it is the sense of this meeting that the action recommended by the committee should be:

"The committee recommends that the 2-ohm relay with caustic soda battery be approved by the association." Carried.

The President: The committee stands excused with the thanks of the association.

Special Committee—Electrical Testing

THE following outline of work was assigned this committee: 1, Recommend methods of testing apparatus and circuits. 2, Recommend the minimum insulation resistance in megohms when renewals are advisable. 3, Recommend ranges and scales for electrical instruments. 4, Prepare forms for recording the results of tests. 5, Prepare specifications for adjustable resistance to be used for testing. 6, Investigate the desirability of standard marking or numbering of relay posts.



W. N. Manuel, Chairman

The committee submitted reports on subjects 1, 3, 4 and 6. In presenting its report on methods of testing apparatus and circuits, the committee submitted drawing 1377—Ground Rod Resistance and Relay and Slot Coil Tests, with the recommendation that it be accepted for presentation to the annual convention for approval and submission to letter ballot.

RANGES AND SCALES FOR ELECTRICAL INSTRUMENTS

The committee called attention to the fact that after the discussion on this subject at the March, 1916, meeting, which brought out the fact that on account of the error due to the low internal resistance of the 1.5-volt instrument, it has no advantage over the 3.0-volt scale, the former range has been eliminated. The present report consists of three combination ranges for field use, also drawing 1378, Scale Ranges for Electrical Instruments, which is to be considered a part of the specification. The ranges are:

1. Where a relatively high degree of accuracy is desired, and is especially useful for current measurements in connection with the testing of high resistance coils for "pick-up" and "drop-away" of armature.

2. Where a relatively high degree of accuracy is desired, and is of more general use (except for measuring "P. U. & D. A." of high resistance coils) than Combination Range No. 1.

3. Where a less expensive instrument is desired, and where a moderate degree of accuracy is sufficient.

The specification is as follows:

Specification for Ranges and Scales for Direct Current Electrical Instruments, 1917.

Combination Range No. 1.

0 .030 amperes 0 to 3. volts.
0 .300 amperes 0 to 30. volts.
0 3. amperes.
0 30. amperes.

Scale consists of 150 divisions, of 15 blocks, of 10 divisions each. Range of readings: Between .003 and 30 amperes; .300 and 30. volts.

Combination Range No. 2.

0 .150 amperes 0 to 3. volts.
0 1.50 amperes 0 to 15. volts.
0 15. amperes 0 to 150. volts.

Scale consists of 150 divisions, of 15 blocks, of 10 divisions each. Range of readings: Between .015 and 15. amperes; .300 and 150. volts.

Combination Range No. 3.

0 .300 amperes 0 to 3. volts.
6.00 amperes 0 to 30. volts.

Scale consists of 60 divisions, of 6 blocks, of 10 divisions each. Range of readings: Between .030 and 6.00 amperes; .300 and 30. volts.

Accuracy.

Guaranteed accuracy shall be ½ of one minimum scale division.

It was recommended that the specification showing the requirements for the combination range and scale instruments, including drawing 1378, be accepted for presentation at the annual convention for approval and submission to letter ballot.

Form for Recording Track Circuit Tests

The committee presented revised drawing 4, Track Circuit Test Chart. The original chart, shown in the March, 1916, Journal, was accepted as a progress report and the committee believes that the plan now shown is sufficient to take care of all necessary requirements. It was recommended that this drawing be accepted for presentation to the annual convention for approval and submission to letter ballot.

Standard Marking of Relay Posts

The result of the letter ballot taken since the 1916 annual convention outlines the work as follows:

1. Relay posts should be marked.
2. The number scheme should be used.
3. Corresponding numbers should be shown on a wire tag in the relay box.
4. The general plan should include such tagging.
5. R. S. A. nomenclature should be followed as closely as practicable.

The committee will proceed accordingly unless otherwise instructed.

Committee: W. N. Manuel (G. R. & I.), chairman; P. M. Gault (I. C.), vice-chairman; M. A. Baird (Erie), Harry Combs (L. E. & W.), C. A. Cotton (A. T. & S. F.), Caleb Drake (C. & N. W.), C. E. Earhart (I. C.), Thomas Holt (P. R. R.), E. E. Ireland (C. I. & L.), G. W. Kydd (C. H. & D.), T. J. O'Meara (N Y. C.), D. W. Rosenzweig (So. Pac.), C. O. Seifert (B. & O.), Charles F. Smith (U. P.), W. N. Spangler (P. R. R.), C. G. Stecher (C. & N. W.), L. L. Whitcomb (N. Y. C.).

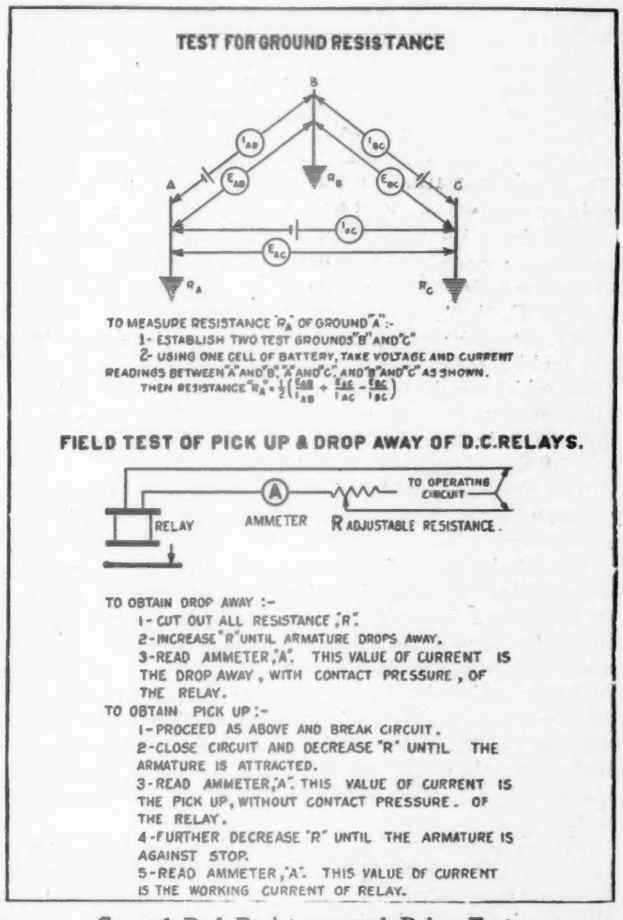
Discussion

P. M. Gault (Vice-Chairman): The committee offers reports on Subjects 1, 3, 4 and 6, and recommends these for acceptance and submission to letter ballot.

F. H. Dodgson: I want to call the committee's attention to the fact that the matter of testing which they have outlined will give considerably different results than the standard R. S. A. method for pick-up and drop-away. I would like to ask whether they intended that this method of test be the test by which they will check up the relays from the manufacturers.

Mr. Gault: This is designed as a field test, but the same method could be used for the purpose of seeing whether the relays are in proper condition when received.

Mr. Dodgson: Under this method, the drop-away would be considerably higher than the drop-away obtained by the R. S. A. method and the pick-up would be higher. For the practical working out of it, it would be difficult when the relay is in service to tell whether the current is sufficient to bring the armature to the point



Ground Rod Resistance and Relay Tests

of stoppage. I think it should be definitely stated that this is not a method for testing the relay circuit and drop-away, but is a method for testing the service condition of the relay, and then the committee should put with this some limit of resistance or limit the values of the drop-away and pick-up.

G. K. Thomas: There is no reference made, in the method of obtaining the drop-away, to the initial charge. It has been my experience that the initial charge makes some difference in the drop-away.

Mr. Dodgson: In making this test, the tests of both drop-away and pick-up are made without saturation.

Mr. Gault: With the exception of the one point of the saturation of the relay, the tests here are identical with those outlined in the Signal Association Specifications.

Mr. Dodgson: The saturation of the relay is the most important point.

E. E. Ireland (C. I. & L.): If the relay has been in service a certain length of time, is it required to be charged with 300 mils for that field test?

Mr. Dodgson: If you are going to get the same conditions you had with the R. S. A. test, it is very important in making this test that the polarity of the relay should not be reversed. If the polarity, when the relay has been in service some time, if you reverse the character of the relay you will find a much higher drop-away and a higher pick-up than the relay had in actual service. If you are going to use this test to find out whether it is operating right or not it is important that you do not reverse the polarity of the relay.

Mr. Gault: This is a field test of the pick-up and drop-away of d. c. relays. We are cutting out all the resistance; that is, giving you all the current that you will ever get through that relay. This is the field test of that one relay.

Mr. Harrington: Testing in this manner would give a variable charge. If you happen to make your tests in wet weather you will get one pick-up and release, and on a dry day you will get a different pick-up and release. That variation in charge cannot be avoided, if you are going to use the track circuit itself as the means of energizing the relay tests. The only way to avoid that is to carry a portable battery, carry a few cells with you, disconnect the battery from the track and give it the regular R. S. A. test.

Mr. Stevens: I think the committee is right. They are making a field test of a relay under operating conditions which apply to that relay. They are not making a laboratory test to say that the relay is proper to put anywhere, but to show that the relay is operating properly on that circuit.

The President: Mr. Gault has said that the test here proposed may also be applied for relays received in your storehouse.

Mr. Dodgson: If these tests are for the purpose of determining whether the relay will perform its function in the circuit in which it is used this method may lead the tester very much astray. Suppose he tests a relay on a dry day, when he is getting a saturation of 150 or 175; he gets a value for his pickup. If that relay also got a pickup on a wet day when its saturation is practically nothing, at its pickup point it would show him by its high saturation that the relay was all right, while, as a matter of fact, it would fail when the track circuit was wet.

Mr. Saunders: You will note that the committee is recommending the field test without a definite statement. I have suggested to the chairman that the adjustable resistance be shown in the multiple connection instead of series, as you have it here. He said he expected to make a change.

Mr. Gault: I overlooked mentioning the point Mr. Saunders has brought up. The drawing will be revised.

Mr. Du Bray: I would like to support the committee in this matter. We know that we put relays in service and after a year or two we don't know what the conditions are that exist for that particular relay. I don't think it is so much a question whether the relay is going to operate successfully as whether it is going to fail; that is, whether it is going to fail on the false clear side. I think it may be in different sections of the country that the drop-away for that section will vary, but we have got to find that out for ourselves and we have got to find it out in some manner with the apparatus that we have in there working.

Mr. Harrington: If you are going to determine whether the track relay is releasing safely, I should think you would make your test under the worst conditions, that is, make your release tests on the dryest possible day, with a freshly set-up battery. If, on the other hand, you want to determine whether your pick-up is exceeding what you think should be allowed and you want to get the highest pick-up with which that relay must work, then you would naturally test for pick-up in wet weather with the lowest initial charge, giving the highest pick-up.

Mr. Drake: This is a field test, and I believe this committee has under consideration now further tests to cover the difference between an acceptance test and the field test.

Mr. Thomas: When we test a relay and find that its release is rather too low, that may be due to one of two things. It may be due to something wrong with the relay itself, or it may be due to the fact there is too high a voltage on the circuit. If it is a track circuit the maintainer may have to cut out more resistance than it should have, and it seems to me that we are liable to decide the relay is affected when the real trouble may be that the maintainer has cut out too much resistance from the circuit.

Mr. Harrington: As I understand Mr. Thomas, you may have a track relay with a high release working on a track circuit in which the maintainer has cut out quite a bit of resistance between the battery and the track, and you may have an unsafe condition with a good relay, or vice versa, you might have sufficient resistance between the battery and the track and the release of the relay be low. You should have sufficient resistance between the battery and the track and look after the release of the relay.

Mr. Dodgson: I am afraid these tests would lead the members astray. The reason I have objected to this test is that for any purpose for which it may be used it is very likely to lead the members into difficulties.

Mr. Harrington: A real measure of safety of a track circuit can be determined, at least in part, by a shunting test across the rails of the track.

Mr. Fugina: As a member of the relay committee, I want to say the committee appreciates that the information in the present specification in reference to testing relays is misleading. That specification really relates to a laboratory test. In making the field test many are getting different results from what they should. Therefore, the Relay Committee proposes to revise the specification and show a method of making the test for laboratory work and another test for field work. I would suggest that this committee make it a point to meet with the Relay Committee at its meeting. I think it would be a mistake to adopt this form at the annual convention.

Mr. Anderson: I would like to ask the committee who would make this test?

Mr. Gault: An inspector.

Mr. Anderson: The directions do not state what will be done after the tests are made. No idea is given here for him to decide whether the relay should be left in service or taken out of service.

W. M. Vandersluis (I. C.): I think that individual instructions of the signal engineer on each road would determine what should be done in that case. In presenting this report the committee had in mind that the people making the tests can reason somewhat and that they must know all the conditions under which the test is taken.

Mr. Harrington: I imagine there would be some difficulty in the committee or the association setting a minimum limit on the release of track relays or other relays, unless they considered all the different types and ages of relays in service. I think certain roads start out on a progressive principle of at first removing relays having a very low release, 15 milamperes, perhaps, and on the

next inspection raise the limit to 20 milamperes, determining whether their limit is a limit which they can with safety maintain.

Mr. Gault: The point brought up was discussed in the meeting of the committee and we did not feel it was up to us to say when or how you would take a relay out.

Mr. Shaver: This is a vital subject. You have heard discussion from what may be an extreme laboratory view and from the view of the man in the field. It is necessary to arrive at something practicable so that the work may be done in the field in a manner fairly acceptable, with results fairly satisfactory. I think it would be a practicable arrangement for a test of this character to have a chart of relays made under conditions similar to those in the field, and then if in the field when the test is made it is found conditions vary from time to time, reference can be made to the chart when reports come in. There is no question in my mind but what a great many of the railroads are neglecting that very thing. If this association did fix a limit on the relay as to its pick-up and drop-away points in service and determining the time when it ought to be taken out of service, I think it would be of real value to many of the railroads in backing them up in the action they should take.

Mr. Anderson: I believe most of the railroads have something of this kind. If the committee has not received copies of instructions of the different roads it would be well for them to collect that data and have it one file.

R. B. Arnold (C. & N. W.): I do not think the committee can specify definitely points at which relays are to be taken out due to insufficient drop-away or pick-up. From the experience I have had in testing relays, I know that the relay coming from the manufacturer will have a different pick-up and drop-away than a relay which has been in service a year or so on the road, due to various conditions which have been brought forth. I also know that both maintenance and construction inspectors have a definite rule laid down to them by the road I work for, and they state very explicitly when the relay shall be taken out. I believe the committee has covered this thing fully as far as the practical working conditions of this test are concerned for a field test.

Mr. Stewart: It does not seem to me that any specific resistance should be accepted as a safe factor. In automatic territory you get a better shunt where there are turnouts than where there are no turnouts. A heavy train is most likely to shunt out a relay on five mils or even six, if there is a turnout on that circuit.

Mr. Gault: On subject No. 3 the committee made inquiry among the different railroads and found there are as many scale ranges as there are signalmen and we took those that we thought most valuable.

Mr. Stevens: I move that we accept the recommendation of the committee in this regard and that the drawing be accepted for presentation to the convention and submission to letter ballot. Carried.

Mr. Stevens: I move that the same action be taken with reference to the form for recording the results of tests, subject No. 4.

Mr. Phinney: I think the question I brought up before, about correcting the resistance of the meter, should be taken into consideration.

Mr. Gault: That was the very thing the committee had in mind in presenting space for entering the meter scale. You can make your own corrections if you wish to do so.

Mr. Hyde: I believe the committee has in contemplation a form to convey all the information necessary to be given the signal engineer. There is a field for the general form and a field for the form of general information anyone might seek.

Mr. Fugina: I would like to ask the committee if they have had time to consider the forms which Committee VII is proposing in connection with securing data to develop information in relation to relays. Committee VII has done a good deal of work on these forms, but it has not been able to give the benefit of its work to this committee. I should not like to see this presented to the annual convention.

On a suggestion of the president Mr. Stevens withdrew his motion.

Mr. Gault: The next is subject 6 on "Standard Marking." We would recommend that this be referred to the Relay Committee for whatever use they may desire to make of it.

The President: I believe we should be governed by the recommendations of the committee. The committee is excused with thanks.

Committee V—Maintenance and Operation

THE following outline of work was assigned to this committee: 1. Prepare rules and instructions for the maintenance and operation of interlocking plants and block signals. 2. Investigate and report on methods of handling trains by signal indications without train orders. 3. Prepare a general history of signaling. 4. Report new developments in manual block signaling.

The committee, under Subject 1, presented detailed instructions for maintenance of alkaline storage battery with the request that they be accepted for presentation at the annual convention for approval and submission to letter ballot.

Owing to unforseen difficulties, it was impossible to prepare the report on Subject 2 for this meeting, but it will be ready for the May meeting.



G. S. Pflasterer, Chairman

Subject 3 is one which is receiving very careful consideration by the committee, and is of such scope and importance that no hasty action should be taken. Good progress was reported.

New Developments in Manual Block Signaling

Where interlocked home signals are in use at stations in current of traffic territory, the separate order and block signal is sometimes eliminated; the interlocked home signal being used to replace it.

In such cases, if delivery of orders is fairly frequent, an indicator of some kind is installed at the station so that when trains are stopped at the interlocking signal the operator can display

this indicator or light for the purpose of notifying the trainmen to come to the office for orders. The above practice can best be used at points where an advance block signal is also provided.

The take-siding signal has been used in one form or another for more than 15 years. It consists of a fixed signal or sign located beyond the heading-in switch of a passing siding and provided with a movable arm or disc by means of which trainmen may be instructed to take siding. It is usually power-operated and controlled manually from the station or block office. In some instances, semi-automatic control is provided. At first, a single-arm signal was used for this purpose. Later, it was found advisable to use a two-arm signal, the top arm governing main line moves and the bottom arm being used as a siding signal. With this arrangement, the top arm may be controlled automatically.

The latest type of siding signal provides an aspect entirely different from that of an ordinary signal which consists of a movable disc or board on which either the letter "S" or the words "Siding" or "Take Siding" may be displayed when it is desired to instruct trainmen to enter a siding. Provision is usually made to illuminate the signal when it indicates "Take Siding."

This advice is especially useful at stations where the entrance switch to passing siding is too far from the station to be interlocked. In territory where the head-in switches are at a considerable distance from the station these signals provide considerable facility in handling trains if they are installed at all such points because trains can then be handled without orders being issued for passing moves.

On some railways a power-operated home block signal is used at the leaving end of passing sidings. This acts as an advance block signal to control trains on the passing siding and permits a minimum delay in getting them under way after the block has been cleared. Such signals are usually arranged so that they cannot be cleared when the station block signal or other signals governing conflicting train movements are set at "Proceed." In some instances, they are also controlled to stop by track occupation for some distance in advance and in the rear of the signal. This type of signal is being superseded on some roads by advance block signals and outlying switch locks.

The advance block signal is a fixed signal located at a considerable distance in advance of the home block signal and is used to sub-divide the block in advance. It is generally a three-position power signal and is controlled from the block station.

At stations where passing sidings are in use the advance signal is usually located a short distance beyond the outlying switch on the passing siding and the switch provided with an electric switch lock controlled from the station.

When the block in advance is occupied a following train may be brought up to the advance signal and held there, so releasing the switching facilities at the station.

Remote control of outlying passing switches is now in use on many railways. This is usually accomplished by means of an electric switch lock and telephone. The switch lock is controlled from the station and is so arranged that the switch cannot be opened without the knowledge and consent of the signalman. Circuits are usually arranged so that it is impossible to clear conflicting signals when the switch lock is unlocked. Provision may also be made so that the switch lock cannot be unlocked, when the track circuits between it and its protecting signals are occupied. When this is done a time release is provided to eliminate the track circuit control when desired.

A more recent method, which is already in use on many railways, and which provides greater facility, is to interlock the outlying switch operating it from the station by means of an electric switch movement controlled by relays. Such switch movements may be operated by local batteries of low voltage or by alternating current or other available energy. Such an arrangement, of course, necessitates the use of signals to protect the switch and actually amounts to a small interlocking plant in itself, controlled from a distance by means of electric circuits. Approach and section locking is usually provided and arrangements are sometimes made whereby the switch can be operated by hand in case of failure. This should be possible only with the knowledge and consent of the signalman at the station.

The above report on Subject 4 was submitted as information.

Committee: Geo. S. Pflasterer (N. C. & St. L.), chairman; L. R. Mann (Mo. Pac.), vice-chairman; E. T. Ambach (C. H. & D.), R. B. Arnold (C. & N. W.), J. Beaumont (I. C. C.), E. A. Black (N Y. C.), F. G. Smith (C. & E. I.), G. K. Thomas (A. T. & S. F.), Caleb Drake (C. & N. W.), Arthur Kelley (C. C. C. & St. L.), H. K. Lowry (C. R. I. & P.), R. W. Meek (T. & N. O.), W. H. Newman (N. Y. C.), and E. Winans (A. T. & S. F.).

Discussion

J. Beaumont (I. C. C.): I would say for the information of the convention that these rules were carefully worked out in conference with representatives of the manufacturers and we can present them to the association with the full assurance that they carry with them the endorsement of the manufacturers.

On motion of T. S. Stevens (A. T. & S. F.), the instructions for maintenance of alkaline storage battery were accepted.

G. S. Pflasterer (N. C. & St. L.): One subject referred to the committee was to investigate and report on methods of handling trains by signal indications without train orders, but owing to unforeseen difficulties it was impossible for the committee to prepare a report for this meeting on that subject.

The President: The question is one of great interest, and I am sure that every man here who has been in the railway service for some time has thought about that question a great deal and its possibilities.

L. R. Mann: A report on this subject will be presented to the May meeting as information for the association.

Mr. Stevens: We are operating trains without orders, under staff, of course. We are operating trains without orders between two points, with siding in between, by signal indication. We are operating trains without orders on one junction point with automatic signals and no manual operation. We are operating trains without orders on double track under current traffic rules. I think it is only a question of time when the operating officers have the necessary confidence in the signals, when the majority of operations on both double track and single track will be handled without orders if it is economical. It is not always economical.

The President: On the Great Northern we have a small mileage which has been operated for two years under automatic block signals, single track, where more than 50 passenger train movements per day are handled and the proposition has worked out with entire satisfaction. If a program of that kind proves satisfactory on a limited mileage there is no reason to suppose it would not prove equally satisfactory on more extended mileage.

The committee was excused with thanks.

Storage Battery and Charging Equipment

THE following outline of work was assigned this committee: 1. Prepare specifications for apparatus and materials used in storage battery installations. 2. Report on comparative economy of various methods for charging storage batteries. 3. Prepare descriptive matter covering use of storage battery in signaling. 4. Prepare plans and specifications for switchboards. 5. Prepare general specifications for power supply for charging storage batteries.

The committee submitted a report on subject 4. It was felt that this subject could best be proceeded with by the preparation of a general specification covering the general fundamental requirements for switchboards for signal work and by the adoption of certain definite panel dimensions which with their various combinations could be made to fill satisfactorily practically every condition.



R. B. Elsworth, Chairman

A general specification for switchboards was therefore submitted in tentative form with Plan 1421, Switchboard Panels and Supports, constituting a preliminary report on this subject.

The report was submitted to the manufacturers for criticisms which were not in all cases received in time for consideration before the printing of advance notice.

The committee recommended that this specification and drawing be carefully checked by the members and manufacturers and the committee be given the benefit of any criticisms, either verbally or in writing.

Committee: R. B. Elsworth (N. Y. C.), chairman; A. B. Hines (B. & O.), vice-chairman; G. E. Beck (N. Y. C.), J. G. Bartell (L. V.), W. E. Boland (So. Pac.), E. G. Hawkins (N. Y. C.), J. Fred Jacobs (C. R. R. of N. J.), A. H. McKeen (O. W. R. & N.), T. J. O'Meara (N. Y. C.), John Parker (N. Y. C.), C. O. Warner (N. Y. N. H. & H.), A. H. Yocum (P. & R.), T. L. Johnson (D. L. & W.).

Report on D. C. Automatic Block Signaling

THE following outline of work was assigned this committee: 1, Prepare specifications for materials. 2, Prepare specifications for field work. 3, Prepare typical circuit plans for automatic block signaling. 4, Prepare specifications for dry battery. 5, Prepare specifications for electric locks for outlying switches and mechanical interlocking, conferring with Committee II. 6, Prepare specifications for low tension line construction, conferring with Committee VIII as to common standard.

A sub-committee was appointed under the first assignment to prepare plans showing track and connections, using: 1, grooved trunking and capping; 2, loricated pipe, and 3, fibre laid in concrete. The committee submitted for discussion plan 1423, Wire Connection to Rail, which is recommended where grooved trunking and capping is used. It was recommended that this plan be accepted for presentation to the annual convention for approval and submission to letter ballot.

Committee: G. H. Dryden (B. & O.), chairman; A. R. Fugina (L. & N.), vice-chairman; R. M. Phinney (C. & N. W.), vice-chairman; F. H. Bagley (L. & N.), E. E. Bradley (W. M.), J. H. Butridge (I. C.), T. N. Charles (C. N. O. & T. P.), J. J. Corcoran (N. Y. C.), R. E. Green (M. C.), E. Hanson (A. T. & S. F.), B. A. Lundy (N. Y. C.), W. B. Nicol (B. & A.), E. B. Pry (P. R. R.), C. F. Stoltz (C. C. C. & St. L.), E. G. Stradling (C. I. & L.), G. W. Trout (P. M.), E. L. Watson (P. R. R.), E. P. Weatherby (T. & P.), F. E. Whitcomb (B. & A.), E. E. Worthing (So. Pac.), Leroy Wyant (C R. I. & P.).

TELEGRAPH SUPERINTENDENTS TO MEET

The Association of Railway Telegraph Superintendents, Western Division, will hold its regular meeting in the La Salle Hotel, Chicago, on Wednesday, March 21.

WESTERN RAILWAY CLUB

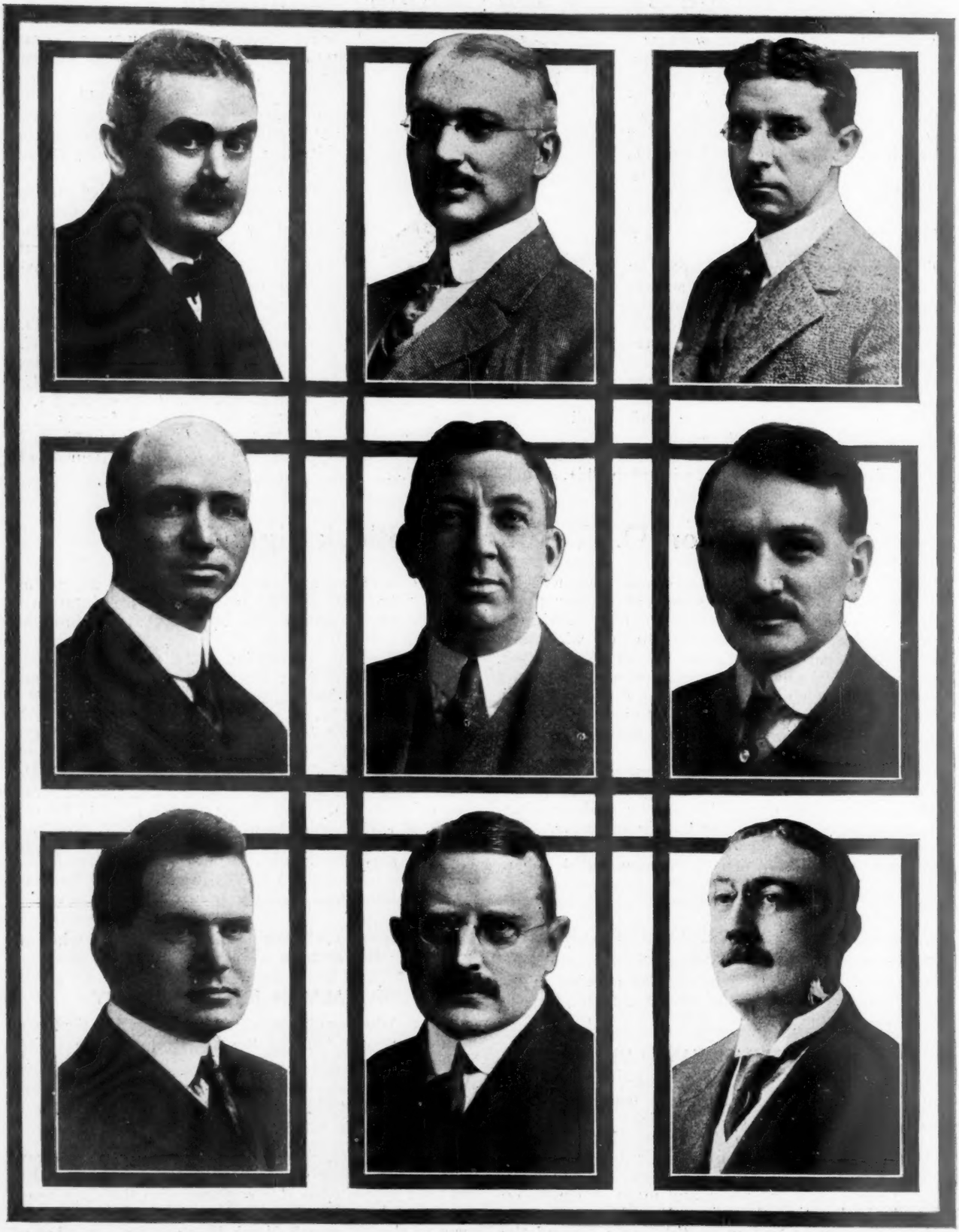
At the meeting of the Western Railway Club, held at the Hotel Sherman, at 8 o'clock last evening, F. W. Thomas, supervisor of apprentices of the Santa Fe, gave an address on "Training Men for the Mechanical Department on the Santa Fe." Mr. Thomas spoke briefly of the changes in American railroads since their inception and more at length on the need of educating the railroad workers. He outlined the apprentice system on the Santa Fe and the extension of the course to include training in the plants of locomotive and airbrake companies as well as the railroad repair shops and showed what the road had accomplished in developing from the ranks of its employes all the skilled mechanics who are needed on the system.

SIGNALMAN JOINS THE ARMY

W. H. Arkenburgh has been appointed a first lieutenant in the Engineer Officers Reserve Corps of the United States Army.

NEW BRIDGE ENGINEER OF THE NORTH-WESTERN

O. F. Dalstrom, chief draftsman in the bridge department of the Chicago & North Western at Chicago, Ill., has been appointed bridge engineer with the same headquarters. Mr. Dalstrom has been in the bridge department of the Chicago & North Western for a number of years and has been performing the duties of bridge engineer since the resignation of W. C. Armstrong, to become chief engineer of the St. Paul Union Depot Company two years ago.



C. W. Kelly, Secretary
P. C. Jacobs
J. Alexander Brown

E. H. Bell, Vice-President
G. C. Isbester
J. B. Strong

P. W. Moore, Honorary Director
E. E. Hudson
M. J. Trees

NATIONAL RAILWAY APPLIANCES ASSOCIATION

Despite the American propensity to speak in superlatives, it can be said without exaggeration that the display of railway appliances at the Coliseum is the greatest of its kind in the world. No show in any foreign country nor any exhibit of railway materials at world's expositions ever was prepared which can compare with it. The National Railway Appliances Association, which is responsible for the success of the Coliseum exhibition and in general represents the interests of the railway supply industry during the conventions of the week, has been in existence for over a score of years. Its chief function is to arrange and conduct the exhibit, which is an important feature each year of the conventions of the American Railway Engineering Association and the Railway Signal Association.



H. M. Sperry, President

The organization has shown a steady growth in strength, numbers and influence since the Road and Track Supply Association, of which it is an outgrowth, organized in 1894, to exhibit at the convention of the Roadmasters' Association. In 1900 it transferred its attention to the American Railway Engineering and Maintenance of Way Association, now the American Railway Engineering Association. In 1910, the name was changed to the Railway Appliances Association, and in 1911 it was incorporated under the laws of Illinois as the National Railway Appliances Association.

The officers and members of the Board of Directors of the association are as follows: President, H. M. Sperry, Bureau of Railway Signaling Economics, New York, N. Y.; vice-president, E. H. Bell, The Railroad Supply Company, Chicago, Ill.; secretary-treasurer, C. W. Kelly, Kelly-Derby Company, Chicago, Ill.; honorary director, P. W. Moore, The P. & M. Company, Chicago, Ill.; directors, E. E. Hudson, Waterbury Battery Company, Waterbury, Conn.; M. J. Trees, Chicago Bridge & Iron Works, Chicago; P. C. Jacobs, H. W. Johns-Manville Company, Chicago; J. B. Strong, Ramapo Iron Works, Hilburn, N. Y.; J. Alexander Brown, Pocket List of Railroad Officials, New York, N. Y.; G. C. Isbester, Rail Joint Company, Chicago.

Henry Muhlenberg Sperry, president of the association, is director of the Bureau of Railway Signaling Economics. He was born in Baltimore, Md., and educated in Philadelphia, Pa. In August, 1881, he entered the service of the Pennsylvania Railroad as a member of the engineering corps, New York division. In 1887 he was appointed supervisor of signals of that division and had charge of the construction of a large number of interlocking plants required by changing the line from Philadelphia to New York from a two- to a four-track road. In December, 1891, he was appointed general agent of the Johnson Railroad Signal Company, and in June, 1894, went with the National Switch & Signal Company as signal engineer and agent in charge of the Western District. While in the service of that company he designed and installed a large interlocking plant at State Line, Ind., and the signaling of the Chicago elevated railroads, the most important of which was on the Union Loop. In January, 1899, he was appointed signal engineer and agent of the Union Switch & Signal Company at New York. While in that position he prepared plans and made a report on the reconstruction of the St. Paul (Minn.) union depot to provide track facilities for ten railroads; he also prepared the preliminary plans and method of signaling for the Interborough Rapid Transit Company, subway division, New York. In February, 1905, he was appointed consulting signal engineer for the Hudson Companies, New York, and prepared plans for the four tunnels under the Hudson river and the large terminal station at Church street, New York, designed to handle 60,000 passengers an hour. He was appointed resident manager of the General Railway Signal Company at New York in February, 1906. He was promoted to sales manager with headquarters at Rochester, N. Y., on January 1, 1910. On November 1, 1914, he was made manager of the department of publicity and education, and on January 1, 1917, entered on his duties as director of the Bureau of Railway Signaling Economics of the same company. Mr. Sperry has been a director of the National Railway Appliances Association since 1911, and in March, 1916, was elected its president.

Edwin H. Bell, vice-president of the association, is president of the Railroad Supply Company, Chicago. He was born in Philadelphia, Pa., and was educated in Blairstown Academy, Blairstown, N. J., and in the Pearce Business College at Philadelphia. In 1890 he was employed in the general manager's office of the Lehigh Valley at Buffalo, and in 1897 entered the employ of the Railroad Supply Company. In 1906 he was elected vice-president and in January, 1916, was made president of that company to succeed Henry S. Hawley, deceased.

PROMOTION FOR E. J. CALDWELL

E. J. Caldwell, in charge of the railway sales department of the Barrett Company, Chicago, has been promoted to manager of the general railroad sales department, with headquarters at New York, succeeding E. H. Poetter, who has been placed in charge of the export department. Mr. Caldwell was born at Urbana, Ill., and entered railway service with the Illinois Central as a stenographer for the road supervisor at Champaign, Ill., in 1898. He held various responsible positions in the engineering and operating departments of this road, becoming secretary to J. T. Harahan, second vice-president of the Illinois Central in 1904 and going with Mr. Harahan when he was made president. Mr. Caldwell left the Illinois Central in March, 1911, to become the railroad representative of the Barrett Company, Chicago, and later was placed in charge of the first railroad sales department of this company.

SANTA FE REUNION

The third annual luncheon of present and past members of the Santa Fe Signal Supervisors Committee was held in the French Room of the Congress Hotel on Monday noon. Those attending this reunion were: Thos. S. Stevens, signal engineer; L. Brown and G. K. Thomas, assistant signal engineers; W. H. Rife, signal supervisor, and T. W. Triplett, division signal foreman, of the Santa Fe; G. R. Cowherd, signal engineer, El Paso & Southwestern; B. T. Anderson, assistant signal engineer, Delaware, Lackawanna & Western; R. B. Hyde, signal and electrical engineer, Thomas A. Edison, Inc.; J. S. Hobson, western manager, and J. E. Saunders, assistant chief engineer, Union Switch & Signal Company.

RAILWAY SIGNAL ASSOCIATION REGISTRATION

Active Members

Anderson, B. T., Asst. Sig. Engr., D. L. & W. R. R., Hoboken, N. J.
Arnold, R. B., Engr., Sig. Engr's Office, C. & N. W. Ry., Chicago, Ill.
Ayers, B. H., Gen. For. Sig. Repair Shop, L. & N. R. R., Louisville, Ky.
Bagley, F. H. Asst. Sig. Engr., L. & N. R. R., Louisville, Ky.
Barnes, A. H., Supr. of Sigs., N. P. Ry., Tacoma, Wash.
Baxter, H. H., Chf. Draftsman, Sig. Dept., C. & N. W. Ry., Chicago, Ill.
Beaumont, J., Sen. Tel. & Sig. Engr., Valuation Board, Interstate Commerce Commission, Chicago, Ill.
Breecher, A. T., Sig. Supr., C., M. & St. P. Ry., Savanna, Ill.
Bridge, Fred, Sig. Supr., Erie R. R., Marion, O.
Brown, Larsen, Sen. Asst. Sig. Engr., A., T. & S. F. Ry., Topeka, Kan.
Butridge, J. H., Chf. Sig. Inspr., I. C. R. R., Chicago, Ill.
Camp, W. M., Editor, "Railway Review," Chicago, Ill.
Carrol, E. C., Supt. Sig. Constr., C. & N. W. Ry., Chicago, Ill.
Christofferson, C. A., Sig. Engr., N. P. Ry., St. Paul, Minn.
Cormick, James H., Sig. Engr., Can. Northern Ry., Winnipeg, Man.
Cotton, Chas. A., Div. Sig. For., A., T. & S. F. Ry., Chillicothe, Ill.
Cowherd, G. R., Sig. Engr., E. P. & S. W. Ry., El Paso, Tex.
Dawson, Wm., Asst. Supr. Sigs., N. Y. C. R. R., West of Buffalo, Chicago, Ill.
Drake, Caleb, Gen. Sig. Inspr., C. & N. W. Ry., Chicago, Ill.
Du Bray, A. B., Sen. Sig. Engr., Interstate Commerce Commission, Kansas City, Mo.
Duffy, C. M., Act. Asst. Sig. Engr., C., R. I. & P. Ry., El Reno, Okla.
Dunham, Chas. A., President, Sig. Engr., Gt. Nor. Ry., St. Paul, Minn.
Dunn, J. H., Sig. Inspr., C., M. & St. P. Ry., Milwaukee, Wis.
Earhart, C. E., Sig. Inspr., I. C. R. R., Chicago, Ill.
Ellis, G. E., care of Div. of Safety, Interstate Commerce Commission, Washington, D. C.
Finch, J. C., Inspr. Sigs., Mo. Pac. R. R., St. Louis, Mo.
Foale, H. J., Sig. Engr., Wabash Ry., Decatur, Ill.
Frantzen, Oswald, Supr. Sigs., N. Y., N. H. & H. R. R., Boston, Mass.
Frazer, A. M., Elec. Engr., D., M. & N. Ry., Duluth, Minn.
Fugina, A. R., Sig. Engr., L. & N. R. R., Louisville, Ky.
Gallagher, E. B., Sig. Inspr., Ill. Cent. R. R., Chicago, Ill.
Gault, Paul M., Office Engr., Sig. Dept., Ill. Cent. R. R., Chicago, Ill.
Gray, G. B., Sig. Inspr., Penna. Lines West, Pittsburgh, Pa.
Guthrie, L. A., Sig. Inspr., Can. Northern R. R., 338 Lipton St., Winnipeg, Man.
Haag, H. F., Chf. Draftsman, Kansas City Southern Ry. Co., Kansas City, Mo.
Hanert, Wm. A., Draftsman, Lines Com., N. Y. C. R. R., Detroit, Mich.
Hiles, Wm., Inspr. of Sigs., C., C. C. & St. L. Ry., Cincinnati, O.
Hoffman, S. C., Sig. Supr., Y. & M. V. Ry., Vicksburg, Miss.
Ireland, E. E., Sig. Inspr., C., I. & L. Ry., Monon, Ind.
Keefe, Wm. J., Asst. Sig. Engr., Public Service Commission of Mass., Boston, Mass.
Kellenberger, K. E., Sen. Sig. Engr., Interstate Commerce Commission, Chicago, Ill.
Kelley, Arthur J., Sig. Supr., C., C. C. & St. L. Ry., Indianapolis, Ind.
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Lowry, H K., Sig. Engr., C., R. I. & P. Ry., Chicago, Ill.
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Mack, E. E., Supr. Sigs., C. & E. I. R. R., Salem, Ill.
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Martin, W. P., Supr. Sigs., Mo. Pac. Ry., Chester, Ill.
Meisel, Benjamin W., Asst. Engr., Sig. Dept., C. & N. W. Ry., Oak Park, Ill.
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Miskelly, Samuel, Asst. Sig. Engr., C., R. I. & P. Ry., Chicago, Ill.
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Stoll, J. Geo., Sig. Supr., C., R. I. & P. Ry., Ft. Worth, Tex.
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Van Steenburgh, W. R., Okonite Co.
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White, J. W., Sales Engr., General Ry. Signal Co., New York, N. Y.
White, R. H., Mgr., Kentucky Engineering & Efficiency Assn., Louisville, Ky.
Wight, S. N., Commercial Engr., General Railway Signal Co., Rochester, N. Y.
Williams, P. P., Eastern Rep., Chicago Railway Sig. & Supply Co., New York, N. Y.
Williamson, A. G., Sig. Engr., Aut. Train Control & Sig. Co., Pittsburgh, Pa.
Ziegler, A. A., Gen. Mgr., United Electric Apparatus Co., Boston, Mass.

THE DECISION IN THE ADAMSON LAW CASE

By Our Washington Correspondent

The Supreme Court held the Adamson law constitutional and valid in all respects. Justices Day, Pitney and Vandevanter dissented. Justice McReynolds announced dissenting views, but bowed to the will of the majority.

The opinion by Chief Justice White says that the law is a regulation, both of hours and wages, and exercises the right to protect the public against an interruption of traffic, adding, "If to deprive employer and employee of the right to contract for wages and to provide that a particular rate of wages shall be paid for a specified time is not a fixing of wages, it is difficult to say what would be. The eight-hour standard is permanently fixed. The fixing of the wage standard resulting from the prohibition against paying lower wages is expressly limited, leaving employers and employees free as to the subject of wages, to govern their relations by their own agreements."

Regarding the power of Congress to regulate wages, he said in part that the business of common carriers by rail is in a sense a public business because of the interest of society in the continuation, operation and rightful conduct of such business; and that the public interest begets a public right of regulation to the full extent to secure and protect it is settled by so many decisions and is illustrated by such a continuous exertion of state and federal legislative power as to leave no room for question on that point. If the situation be taken into view, the dispute as to a standard of wages, the failure to agree, the resulting absence of such standard, the entire interruption of interstate commerce which was threatened and the infinite injury to the public interest which was imminent, it would seem inevitable to result that the power to regulate necessarily obtained and was subject to be applied to the extent necessary to provide a remedy for the situation by appropriate action for a standard of wages, to fill the want of one caused by the failure to exercise the private right on the subject. This must be so unless it can be said that the right to so regulate as to save and protect the public interest did not apply to a case where the destruction of the public right was imminent.

The Court gave no interpretation of the meaning of the eight-hour standard of a day's work and compensation.

N. R. A. A. ANNUAL MEETING

The annual meeting of the National Railway Appliances Association will be held at the Coliseum on Tuesday, March 20, at 11 a. m. The order of business will be as follows: Roll call; reading of minutes; President's report; Treasurer's report; general business, revision of constitution; election of officers; adjournment.

PRESIDENT'S ANNUAL DINNER

A. S. Baldwin, president of the American Railway Association, gave a dinner to the officers and directors of that association and the Committee on Arrangements in the English Room at the Congress Hotel at 7 o'clock last evening. This dinner, which has become an annual event, has been given by the presidents of the association for a

number of years. Among those present were: C. A. Morse, Prof. A. N. Talbot, J. B. Coxe, G. H. Bremner, C. F. W. Felt, H. R. Safford, F. R. Coates, William McNab, W. A. Christian, E. H. Lee, C. E. Lindsay, J. G. Sullivan and W. B. Storey.

DINNER OF COMMITTEES I AND X POSTPONED

The annual dinner of the present and past members of committee I of the Railway Signal Association and committee X of the American Railway Engineering Association, scheduled for this evening, has been postponed one year on account of the fact that the threatened strike kept so many of the members away. Not more than eight or ten out of the total number were available.

A. W. P. A. MEETING

The executive committee of the American Wood Preservers' Association held a meeting at the Hotel Sherman yesterday, concluding with a dinner in the evening, at which about 30 members of this association were present. One of the subjects presented for discussion was that of the manner in which the members could cooperate in the defense of this country if war occurred. Plans for the work of the association during the ensuing year were also considered.

WASHINGTON REGIONAL COMMITTEE REPORT*

During the past year and a half the price of copper sulphate, or blue stone, as it is commonly called, has advanced so rapidly that its use has been found almost prohibitive. This advance has been due primarily to the advance in copper as well as that of the sulphuric acid which is required to convert the copper into copper sulphate. The price of zinc has advanced in a similar manner, but as zinc is required in the caustic soda cell as in the gravity cell, there is no advantage on this account to be gained from using the caustic soda cell.

The gravity battery used in signal work has a six by eight inch jar, a four-pound round zinc and a pan-bottom copper. The primary caustic soda cell has a copper oxide positive element, a zinc negative element and an electrolyte of caustic soda of approximately 27 deg. Baume. The jar used for the caustic soda cell is six inches in diameter and ten and one-half inches high and the elements are assembled to give a cell of low internal resistance.

With the caustic soda cell the positive element or copper oxide is molded into a plate and also in a perforated container in the low-voltage type and contained in a perforated container in the high-voltage type. In the latter case the copper oxide is in a loose flaky condition. In both types of cells the copper oxide assembly is placed between two sheets of cast zinc spaced equally between the two parallel faces of the zincs. The zinc plates are insulated from the copper oxide by means of porcelain lugs and bushings. Both the zinc and copper oxide are bolted together in very rigid and substantial manner so that they form an integral part and are suspended from the cover by a suspension bolt. The electrolyte is a caustic soda solution of about 27 deg. Baume specific gravity. The electro-chemical action takes place when the external circuit or the one wire of the zinc is connected to the suspension bolt on the cover. The internal action consists of the caustic soda attacking the zinc, forming sodium zincate and setting free hydrogen. The hydrogen unites with the oxygen in the copper oxide, forming water, reducing the black copper oxide to red metallic copper. The sodium zincate formed is soluble in the caustic soda in the cell and remains in solution as long as the caustic soda is strong enough to hold it. When the strength of the caustic soda has reached a certain point, any sudden change in temperature is likely to cause the sodium zincate to form long needle-shaped crystals, producing what is commonly known as congealing. The needle crystals will dissolve in the soda when warmed up, but the action is quite slow.

The sodium zincate formed from the electro-chemical action is much heavier than the caustic soda and as a consequence settles down to the bottom of the jar, forcing the caustic soda into the upper part of the jar. As the action of the cell goes on, the amount of sodium zincate increases, and if the assembly extends far enough towards the bottom of the jar, there will be a time when the sodium zincate on the bottom will crystallize out on the surface of the zinc and copper oxide and even the glass jar. This is due to insufficient amount of caustic soda at that point. In the primary cells now on the market the assembly is sufficiently high in the solution so that this action is not liable to occur and its occurrence is getting rarer each day. The function of the oil on top of the soda is to keep the air from the soda, thus preventing the formation of the carbonates of soda, as well as to prevent evaporation and creeping of the solution over the edge of the jar and up the connections.

Prior to the great advance in the price of bluestone, gravity batteries were the most common source of current for track circuits, and a great many roads thought that caustic soda cells would not operate satisfactorily or were not safe to use on account of their having a lower voltage. During the past year the great majority of gravity batteries on track circuits have been replaced with caustic soda cells and in many places it was found necessary to use multiple series connection to operate satisfactorily on account of long section or extra bad track conditions.

*From the abstracts published in the R. S. A. Journal for March, 1917.

R. S. A. COMMITTEE MEETINGS

Committee VIII of the Railway Signal Association on Electric Railway and A. C. Signaling will meet Wednesday morning at 9 o'clock in the office of the vice-chairman, H. K. Lowry, signal engineer, Chicago, Rock Island & Pacific. Contrary to the usual practice, there are no regular committee meetings scheduled for today. This is due in large part to the fact that so many chairmen are unavoidably absent. Only 4 out of 15 heads of committees were registered at the meeting this year. Eight members of Committee VIII came for the committee meeting who could not get here for the stated meeting yesterday.

NATIONAL SCALE MEN'S ASSOCIATION

The first session of the second annual meeting of the National Scale Men's Association was held at the Ft. Dearborn Hotel, Chicago, on Monday morning, with about 150 members in attendance. In the session on Tuesday afternoon, which opens at 2 o'clock, several subjects of particular interest to railroad men who are concerned with the construction of scale foundations and the maintenance of scales will be discussed. The last papers will be presented at the Wednesday morning session, and the convention will close with the executive session which will be held on Wednesday afternoon.

N.R.A.A. Exhibit at the Coliseum



THE optimism of the railway supply fraternity was evidenced in a striking manner during the last few days by the complete disregard of the threatened railway strike and the continuous prosecution of plans for the annual exhibit of the National Railway Appliances Association, which opened at the Coliseum and Annex yesterday morning. Even though the indications late last week were that a strike would occur, the preparation of the exhibits proceeded continuously and as a result they were practically all in place when the display opened yesterday morning and the show was in full operation by 10 o'clock. It will remain open daily from 8 a. m. to 10 p. m., closing Thursday night.

In many ways this year's exhibit bids fair to be the most successful ever held by this association. Because of the large number of firms which desired representation, the amount of space allotted to some of the companies was reduced and 161 firms are presenting exhibits as compared with 143 last year. At the same time 68 firms which applied for locations could not be accommodated, practically all of the space having been allotted at the meeting of the board of directors last November.

An innovation introduced this year is the fixing of the main entrance through the Annex, while the exit is through the center of the Coliseum on the Wabash avenue side. In previous years the exhibitors in the Annex have felt that this space was less desirable than that in the main building because many railway men failed to enter that part of the building. The rearrangement this year eliminates this objection and also avoids any conflict between those entering and leaving the building.

As in previous years the exhibit is highly educational in character. Almost all the exhibits consist of full-sized devices of the different companies to the exclusion of models and drawings. Many of the exhibits, particularly of signalling devices, are equipped with power and are in motion.

A study of the entire display impresses one with the fact that it is representative of the railway engineering, maintenance of way and signalling fields. Most of the established firms are represented, as a result of which railway men are finding it possible to study and compare materials more thoroughly than is possible in any other manner. Tickets of admission have been distributed very generally among railway men, although the presentation of passes or other evidence of railway employment will admit one without a ticket.

Following the precedent established last year, a number of the lumber associations are presenting joint exhibits. These are educational in nature and are arranged by photographs and drawings to show economical and scientific uses of timber.

The signal exhibits are grouped in the north end of the building, as in previous years, and occupy approximately the same amount of space. They consist very largely of standard equipment, although a number of important improvements and modifications have been introduced which are attracting much attention from signal men.

The exhibit of the National Railway Appliances Association this year is characteristic of previous displays of this association in its thorough businesslike character. Contrary to the practice at other exhibits held in this building, no musical programs are presented. Neither is any attempt made to provide comfortable lounging facilities for the entertainment of guests, but the entire space allotted to the various companies is utilized for the presentation of their devices in a manner that will give the railway men the maximum amount of information.

No attempt is made to encourage the exhibition of untried devices, but, on the contrary, great care is taken to insure that no stock jobbing or promotion schemes are displayed. This feature of the exhibit has given it a prestige which has done much to create confidence among railway men.

The following is a complete list of the exhibitors:

Adams & Westlake Company, Chicago, Ill.—Railroad signal lamps, including switch and semaphore lamps, classification and marker lamps, several different types of hand lanterns, and switch and signal locks. Represented by G. L. Walters, H. G. Turney, C. B. Carson, W. J. Piersen, W. S. Hamm, A. S. Anderson, F. W. Foehringer and J. F. Stender. Spaces 83, 84 and 102.

Adams Motor & Manufacturing Company, Chicago, Ill.—Railway inspection motor cars. Represented by W. E. Adams, N. W. Adams, R. A. Harris and L. Gerhardt. Spaces 218 and 219.

A. G. A. Railway Light & Signal Company, Elizabeth, N. J.—

Railroad signals. Represented by J. K. Howard, C. S. Tiemann and T. M. Derickson. Spaces 135 and 136.

Ajax Rail Anchor Company, Chicago, Ill.—Ajax double grip rail anchors. Represented by F. B. Bradley, H. G. Elfborg, Gus N. Holmberg and Paul Hoffman. Space 14.

American Hoist & Derrick Company, St. Paul, Minn.—Illuminated photographs. Represented by F. J. Johnson, W. O. Washburn, J. L. Hickey, W. L. Manson, Harold Washburn and C. C. Austin. Space 67.

American Steel & Wire Company, Chicago, Ill.—Rail bonds, electrical wires and cables, signal wires, triangle mesh concrete reinforcement, fence, posts, switching and truck cables, wire rope. Represented by L. P. Shanahan, J. F. Alexander, M. E. Evans, A. W. Froude, C. J. Boon, J. W. Collins, J. W. Meaker, Jr., B. H. Byder, C. S. Knight, Jr., C. F. Wiley, M. Floto, F. J. Conkling, Wm. Pfundt and E. Braine. Spaces 51 and 70.

Alger Supply Company, Chicago, Ill.—Electric bells (Schwarze), a. c. and d. c., insulated joints (Roach), kerosene torches (Chausse), Mick adjustable metal pipe carrier tops, "Steelite" flexible metal conduit for lamp and drill extension connections. Represented by O. S. Flath and J. M. F. U. Serold. Space 167.

American Kron Scale Company, Chicago, Ill.—Automatic springless dial scales for freight house, baggage room and industrial purposes. Represented by E. Ohnell, W. W. Camp and C. F. Larson. Space 223.

American Valve & Meter Company, Cincinnati, Ohio.—Poage automatic water columns; Poage automatic float valves; economy low switch stands; interlocking switch stands; safety switch locks. Represented by John T. McGarry, John De Pinal, F. C. Anderson and Daniel J. Higgins. Spaces 130-132.

American Vulcanized Fibre Company, Wilmington, Del.—Vul-cot fibre insulation for rail joints. Represented by C. C. Bell, W. A. Jordan, John Barron and William Maxwell. Space 127.

Anchor Company, Chicago, Ill.—Rail anchors. Represented by T. B. Bowman, F. L. Dwyer and W. C. McMahon. Space 165.

Armco Iron Culvert Manufacturers' Association, Middletown, Ohio.—Armco iron culverts and other Armco iron products. Represented by G. F. Ahlbrandt, W. W. Sebald, F. B. Milhoan, S. E. Graeff, E. M. Johnson, W. S. Stephenson, W. E. McCann, H. O. Stevens, R. D. Black, H. W. Rinearson, B. G. Marshall and John S. Roney. Spaces 99-100.

Asphalt Ready Roofing Company, New York, N. Y.—Hudson individual asphalt shingles; Hudson strip asphalt shingles; roofing material in rolls, i. e., Protection brand, with 6-in. lap laid with all nails covered, Hudson brand asphalt felts. Represented by H. J. Zehder, Stanley H. Bass. Space 170.

Associated Manufacturers of Malleable Iron, Cleveland, Ohio.—Tests and general description of manufacture and uses of malleable iron. Represented by S. H. Standish, J. C. Nulsen and A. M. Fulton. Space 185.

Automatic Electric Company, Chicago, Ill.—The automatic telephone system; the automatic annunciator system. Represented by J. H. Finley, R. H. Burfeind and Frank Holstrom, Jr. Space 222.

Ayer & Lord Tie Company, Inc., Chicago, Ill.—Wood block for floors. Represented by A. H. Noyes, B. S. McConnell, R. G. Inslee, S. C. Conway, L. S. Eifel, W. H. Blythe and F. W. Decker. Space 224.

The Barrett Company, Chicago, Ill.—Barrett specification built-up roofing; sill covering; Holts roof construction; wood preservatives; bridge waterproofing; Tarvia station platforms; metal paint; prepared roofing; damp proofing. Represented by E. J. Caldwell, E. H. Poetter, C. F. Ames, Sr., G. R. McVay, W. W. Wamsley, W. S. Babcock, J. J. Ross and J. A. Clarity. Spaces 107-108.

Bethlehem Steel Company, Bethlehem, Pa.—Switchstands; Manard rail bound frogs; combination brace and tie plate; heat-treated bolts. Represented by Robert E. Belknap, E. S. Knisely, R. W. Gillespie, Neil E. Salsich, H. E. Stoll, F. A. Weymouth, H. A. Wagner, Thos. Earle, G. S. Vickery, R. L. Gillespie, C. A. Allen, E. S. Illig, E. S. Goodwillie, Stanley H. Smith, J. S. Hegeman, Fred H. Ogden, J. M. Price, Karl C. Banks, John F. Hennessy, W. K. Smith, V. E. Ellstrom, C. M. Daniels, W. C. Chapman, H. Lennon, C. S. Roberts and H. M. Stark. Spaces 199-216.

L. S. Brach Supply Company, Newark, N. J.—Complete line of lightning arresters, which include non air-gap, vacuum and choke coil types, to which have been added new combination types of choke coil vacuum and choke coil non-air-gap; new adjustable resistance unit in addition to former resistance units; new curtain signal; the Brach automatic flagman for crossing protection, a new crossing gate lamp; a new dry battery and a complete line of signal accessory materials. Represented by Godfrey Gort and L. S. Brach. Space 2.

Bryant Zinc Company, Chicago, Ill.—Highway crossing signal, batteries, bells, lightning arresters, signal accessories, etc. Represented by Harry F. Worden, William P. Graves, John Hensel, Stanley C. Bryant, A. F. Klink, J. P. Costigan, William Reid and Roy Parmalee. Spaces 153-156.

The Buda Company, Chicago, Ill.—Motor cars, electric trucks, bumping posts, crossing gates, electric locomotive headlights, jacks, switch stands, tool grinders, car replacers, etc. Represented by F. E. Place, L. M. Viles, W. P. Hunt, Jr., H. C. Beebe, C. H. Bull, W. C. Dyer, J. J. Gard, M. A. Evans, G. E. Bryar, W. F. Hebard, J. L. Artmaier, R. C. Horton, W. Krause, T. H. Wheeler, E. Conant, R. M. Smith, J. E. Murray. Spaces 86-89.

Carbic Manufacturing Company, Duluth, Minn.—Carbic flare-lights. Represented by Gordon Paterson, D. C. Duncan, M. A. Dantzler and H. N. Haberstroh. Spaces 171½-172½.

Carnegie Steel Company, Pittsburgh, Pa.—Steel cross-ties, Duquesne rail joints, Braddock insulated joints, rolled locomotive pistons, rolled automobile fly-wheels, reinforced angle bars, steel piling, special lubricated rails for curves. Represented by John McLeod, C. E. Dinkey, C. F. W. Rys, J. K. Boyd, J. S. Unger, John W. Dix, N. M. Hench, Edwin S. Mills, C. B. Friday, G. W. Landrus, George Baker, W. J. Totten, P. W. O'Brien, J. B. Arnold, O. H. Baker, F. C. Ohl, W. C. H. Carhart. Spaces 51, 53, 71, 72.

Cast Iron Pipe Publicity Bureau, New York, N. Y.—Cast iron pipe, bell and spigot and flanged; cast iron train shed columns. Represented by R. C. McWane and F. E. Hutchins. Space 202.

Chicago Bridge & Iron Works, Chicago, Ill.—Models of locomotive service steel water tanks, enlarged pictures showing various tank installations, stereopticon machine operated automatically, showing views of products. Represented by Merle J. Trees, George T. Horton, Robert H. Murray, Horace B. Horton, Chas. S. Pillsbury, Kenneth I. Small, H. Bruce Murphy, Clinton M. Ladd, Frank L. Cook, Lewis McDonald, Hiram T. Horton, Harry Clifford Brown, James C. Vosburgh, George S. Sangdahl, Ralph Green, Glenn W. Tisdale, Henry C. Zierleyn, Robert M. Campbell, Otto A. Bailey, Joseph L. Zeller, Stephen A. Poyer, Francis E. Lee and Edward G. Daniels. Spaces 65-66.

Chicago Flag & Decorating Company, Chicago, Ill.—Excel railway signal flags. Represented by George L. Glendon, G. Magnessen, Charles Kelly and Thomas Glendon. Space 187.

Chicago Malleable Castings Company, Chicago, Ill.—Thomas rail anchor tie plate. Represented by Warren Moore Osborn, James S. Llewellyn, H. E. Bryant and Ralph Schmidt. Space 180.

Chicago Pneumatic Tool Company, Chicago, Ill.—Chicago Pneumatic simplate valve fuel oil compressor; Class A-O engine; Chicago Pneumatic water lift pump; Oliver-Boyer speed recorder, Boyer speed recorder with clock attachment; Boyer Pneumatic riveting, calking and chipping hammers; little giant air drills; hummer hammer drills. Represented by C. E. Walker, W. P. Presinger, C. B. Coates, H. E. Seidl, J. C. Campbell, J. L. Cauby and P. Mihleder. Spaces 115-116.

Chicago Railway Signal & Supply Company, Chicago, Ill.—Electrical and mechanical railway signal materials and devices, including highway crossing bells and "Wig-wag" type crossing signals. Represented by E. W. Vogel, A. C. Dunne, H. E. Gifford, P. P. Williams, W. H. McClintock, W. H. Dayton, C. N. Suhr, W. C. Martin and F. L. Rainbow. Spaces 96, 97 and 98.

Cleveland Frog & Crossing Company, Cleveland, Ohio.—New manganese track society standard rail-bound frogs, new design of manganese crossing, switch stands and switch accessories. Represented by George Stanton, L. G. Parker and George Arnold, Jr. Spaces 90-91.

Creepcheck Company, Inc., New York, N. Y.—Creepcheck rail anchor. Represented by O. Metcalf, C. Genscher, J. Sheehan and A. J. Dinklage. Space 205.

Crerar-Adams & Co., Chicago, Ill.—Eureka bonding drills; Calumet track drills; standard improved tubular truck; Hercules pressed steel trucks. Represented by W. I. Clock, Russell Wallace, J. A. Martin, G. D. Bassett, E. C. Doehler and R. M. Bullard. Space 28.

D. & A. Post Mold Company, Three Rivers, Mich.—"D. & A." steel molds and machines for line, anchor and brace fence posts; "D & A" tie wire fence fasteners for concrete fence posts; special form for signs and property markers, mile posts, etc. Represented by G. H. Dougherty, O. Dougherty and L. W. Dougherty. Spaces 163-164.

Detroit Graphite Company, Detroit, Mich.—Paints for bridges, building steel water tanks, signals and a general line of paints for railroad use. Represented by T. R. Wyles, L. D. Mitchell, A. H. Kuerst, W. C. Bradford, L. F. Flanagan, W. D. Waugh, J. J. Hogan, E. Booth and DeWitt C. Smith. Space 106.

Paul Dickinson, Inc., Chicago, Ill.—Cast iron smoke jacks, cast iron chimneys, cast iron telephone booth, sheet metal and cast iron ventilators, portable locomotive drafter. Represented by A. J. Filkins and J. A. Meaden. Space 101.

Dilworth, Porter & Co., Inc., Pittsburgh, Pa.—Tie plates and spikes. Represented by W. F. Schleiter, A. Morrison, Joseph Dilworth and C. Stein. Space 27.

Dixon, Joseph, Crucible Company, Jersey City, N. J.—Dixon's silica graphite paint; airbrake and triple valve grease; boiler graphite; Ticonderoga flake graphite; motor graphite; Eldorado drafting pencils. Represented by H. W. Chase, J. E. Simpson, R. R. Belleville and H. J. Evon. Space 117.

Duff Manufacturing Company, Pittsburgh, Pa.—Genuine Barrett jacks; Duff ballbearing screw-jacks; Bethlehem hydraulic jacks. Represented by E. A. Johnson, T. A. McGinley, C. A. Methfessel, R. S. Rubincam and C. N. Thulin. Space 113.

Thomas A. Edison, Inc., Bloomfield, N. J.—Primary batteries. Represented by F. J. Lepreau, E. W. Brown, P. A. Garrity, I. P. Rodman, E. W. Newcomb, P. B. Hyde, E. McGall and O. P. Rose. Spaces 19-20.

Edison Storage Battery Company, Orange, N. J.—Edison alkaline storage batteries for railway signaling and railway train lighting. Represented by H. G. Thompson, F. V. McGinnis, F. T. Sawyer, H. M. Roberts, W. F. Bauer and H. J. Butler. Spaces 21-22.

Electric Railway Improvement Company, Cleveland, Ohio.—Erico rail bonds, Erico oil furnaces, portable electric welders for rail bonds, portable electric grinders. Represented by G. Howatt, M. T. Stanton and F. H. Neff. Space 4.

Electric Storage Battery Company, Philadelphia, Pa.—Portable exide batteries types KXS; semi-portable ironclad exide batteries for electric interlocking plants; ironclad exide batteries for industrial trucks; chloride accumulators for car lighting. Represented by G. H. Atkin, T. Milton, J. Lester Woodbridge, H. M. Beck and H. E. Hunt. Space 1.

Eymon Continuous Crossing Company, Marion, O.—Continuous rail crossing. Represented by J. H. Eymon and Byron E. Wilson. Space 169½.

Fairbanks, Morse & Co., Chicago, Ill.—Fifteen horsepower "Y" engine, direct-connected to 9 kw. 110-volt, d. c. generator; motor-driven centrifugal pump, direct-connected; both of these outfits in operation; No. 11 standpipe split case centrifugal pump; Nos. 36, 38, 32 and 33 motor cars; also a power top applied to standard No. 1 handcar, fitted with Hyatt roller bearings; dial scale, ball-bearing motors and special exhibit of sectionalized ball-bearing a. c. motor. Represented by A. A. Taylor, G. W. Lewis, D. K. Lee, Geo. J. Akers, J. L. Jones, H. J. Renken, H. E. Vergosen, E. J. Coverdale, E. C. Pendray, F. P. Drinker, F. M. Condit, L. H. Matthews, K. P. Brown, E. C. Golladay, G. Howard, H. L. Hilleary, E. J. Vergosen, J. T. Gratiot, C. H. Wilson and J. C. Flanigan. Spaces 73-76, 92-95.

Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn.—Gas engines; power deck; motor cars. Represented by F. E. Wade, H. E. Wade, W. F. Kasper, R. B. Ballard, J. E. Murphy, Don Shepard and H. D. Fitz. Spaces 125 and 144.

Federal Signal Company, Albany, N. Y.—Railway signals and interlocking apparatus. Represented by A. H. Renshaw, J. W. Hackett, S. J. Turreff, H. G. Thompson, P. Renshaw, M. R. Briney, W. H. Reichard, H. P. Ober, F. Renshaw, Carl Henze, J. Kelly, H. C. Ware, C. N. Beckner and Frederick Pruyn. Spaces 36, 37, 55 and 56.

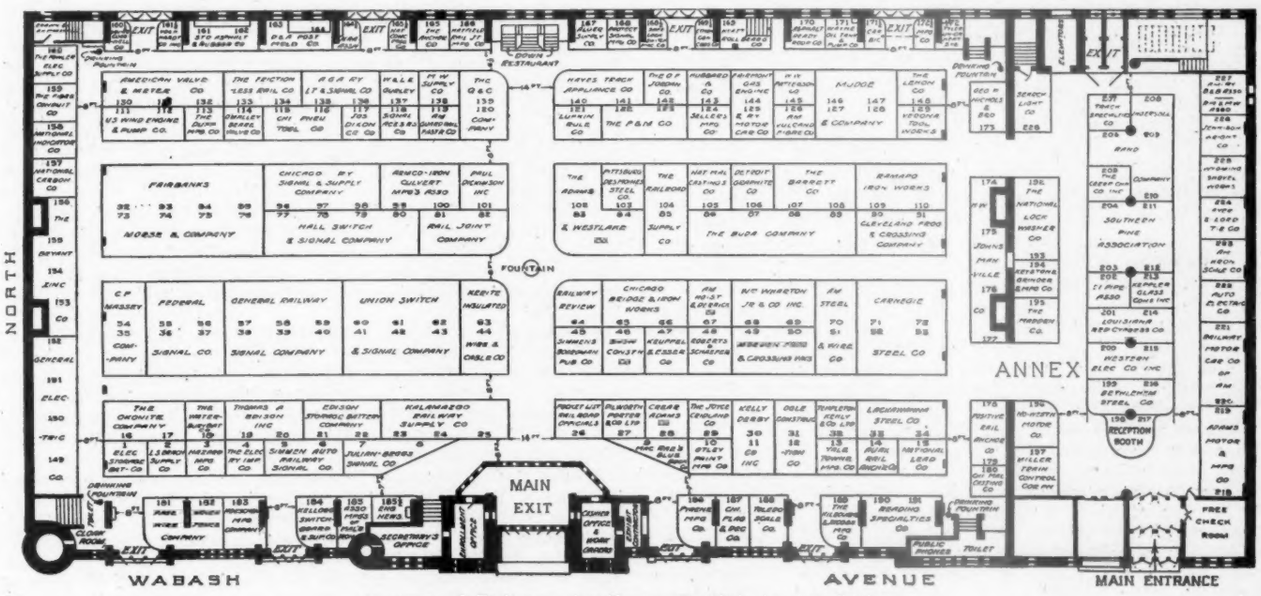
The Fibre Conduit Company, Orangeburg, N. Y.—Orangeburg fibre conduit and fittings. Represented by W. W. Smythe, Jr., F. C. Smith and D. E. Crum. Space 159.

Fowler Electrical Supply Company, Toledo, Ohio.—Electric crossing gates. Represented by H. R. Fowler and J. Howard Benton. Space 160.

The Frictionless Rail, Boston, Mass.—Frictionless rail, companions to standard sections. Represented by F. A. Barbey, S. W. Simonds, G. H. Bryant and T. F. Dwyer, Jr. Spaces 133-134.

General Electric Company, Schenectady, N. Y.—General reception space. Represented by C. C. Bailey, H. M. Jacobs, L. W. Shugg, W. H. Sigourney, B. F. Bilsland, S. W. McCune and A. W. Sharp. Spaces 149-152.

The General Railway Signal Company, Rochester, N. Y.—Eight-lever, model 2, d. c. electric interlocking machine; a. c. electric interlocking; d. c. and a. c. model 2A signals; semi-automatic dwarf signals; high and dwarf position-light signals; indoor and outdoor colored light signals; high and low voltage model 5 switch machines; adjustable deflecting bar; self-cleaning switch adjustments; model 2B electric locks; switch circuit controllers; line and track relays, both a. c. and d. c.; indicators; clock-work time release; line and secondary transformers; resistance and impedance units; "copper-cup" ground plates; lightning arresters; R. S. A. terminals and colored photostatic enlargements. Represented by A. T. Carter, P. E. Carter, S. M. Day, C. M. Deardorff, F. L. Dodgson, J. A. Geneser, F. N. Hall, W. S. Henry, A. C. Holden, W. K. Howe, S. Johnson, F. H. Jones, R. F. Kelley, E. C. Larry, R. C. Leake, J. C. Lindner, H. W. Lucia, F. W. Moffett, F. W. Rizer, V. I. Smart, J. E. Stephenson, L. Thomas, A. Thomson, J. W. White, S. N. Wight, J. R. Wills, M. Wuerpel and W. R. Young. Spaces 38-40, 57-59.



Layout of Railway Appliance Exhibit in the Coliseum

W. & L. E. Gurley, Troy, N. Y.—Engineering and surveying instruments; standard weights and measures, including railroad track scale inspectors' outfits. Represented by L. C. Higbee and W. S. Hopkins. Space 137.

Hall Switch & Signal Company, New York, N. Y.—Automatic signaling, electric interlocking and selector apparatus. Represented by H. W. Wolff, W. J. Gillingham, H. L. Hollister, J. A. Ritter, B. A. Hinman, D. R. Day, H. B. Taylor, Roy Connell, E. J. Blake, O. B. Frink, C. G. Harwig, O. S. Field, G. Rekers, W. C. Hart, G. Latimer, W. G. Brown and C. A. Hinds. Spaces 77-80.

Hatfield Rail Joint Manufacturing Company, Mason, Ga.—Hatfield rail joint. Represented by Walter T. Johnson and U. R. Hatfield. Space 166.

Hayes Track Appliance Company, Richmond, Ind.—Hayes derails with operating and target stands. Represented by R. W. Slautterback, S. W. Wallace, Arthur Gemunder, F. C. Stowell, E. L. Ruby, W. Harding Davis and S. W. Hayes. Spaces 140-141.

Hazard Manufacturing Company, Wilkes-Barre, Pa.—Hazard railroad signal wires and cables and other insulated copper wire products. Represented by A. W. Gabriel, G. P. Cady, C. P.

Brodhun, W. S. Hart, W. T. Keefe, L. W. Allen and G. W. Steinbrenner. Space 3.

Hoeschen Manufacturing Company, Omaha, Nebr.—Magneto-mechanical crossing signals, magneto track instruments, annunciators. Represented by F. K. Davis, E. Willrodt and G. H. Carlson. Space 183.

Hubbard & Co., Pittsburgh, Pa.—Track tools of various kinds; shovels; hammers; wrenches; clawbars. Represented by W. H. Remmel, J. V. Smith, O. W. Youngquist, Geo. H. McCammon and J. W. Hubbard. Space 143.

Hyatt Roller Bearing Company, Newark, N. J.—Flexible roller bearings for section cars, for signals and for special devices. Represented by J. D. Mooney, D. Gleisen, Geo. O. Helmstaedter and W. R. Bylund. Space 169.

Ingersoll-Rand Company, New York, N. Y.—Imperial pneumatic tie tampers; Imperial hand cars; mounted portable compressors, both gasoline engine and electric motor driven, in capacities to operate two or four tamping machines; "Little David" pneumatic drills for setting in screw spikes; "Little David" grinders for grinding rail joints; "Little David" hammers for riveting, chipping, calking and scaling, including "Little David" Jam riveters for work in constricted places; rock drills for culvert work. Represented by W. H. Armstrong, Chas. Dougherty, D. H. Seeley, L. D. Albin, C. W. Melcher. Spaces 206-210.

Jennison-Wright Company, Toledo, Ohio.—Kreolite wood blocks for shop floors, loading platforms, freight depots, bridges and track work. Represented by F. M. Enright, F. E. Jennison and A. W. Cobley. Space 226.

H. W. Johns-Manville Company, New York, N. Y.—Smoke jacks, asbestos roofing, wool felt roofing, transite shingles, asbestos packing, conduit, fire extinguishers and other railway supplies. Represented by J. E. Meek, J. C. Younglove, G. A. Nicol, F. X. Connolly, C. D. Folsom, H. Flannagan, R. A. Hamaker, W. J. Hennessy, F. J. Horne, P. C. Jacobs, D. L. Jennings, H. L. Leach, C. E. Murphy, H. G. Newman, W. D. Otter, H. B. Sewell, E. T. Wade, E. H. Willard and J. H. Trent. Spaces 174-177.

O. F. Jordan Company, East Chicago, Ind.—Ballast spreader, car door track. Represented by Walter J. Riley, R. E. Bressler, W. J. Tangerman, J. Hickey and E. Vanderhoef. Space 142.

The Joyce-Cridland Company, Dayton, Ohio.—Hoisting jacks for railroad and industrial use. Represented by W. F. Bippus, J. M. Sweitzer, N. Kohl and Charles Derby. Space 29.

Julian-Beggs Signal Company, Terre Haute, Ind.—Automatic train control. Represented by Stephen Smith, Thos. E. Clark, C. B. Stone and M. H. Hovey. Space 7-8.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Motor cars, velocipedes, track drills, track jacks, track gages, track levels, improved reinforced pressed steel wheels, reinforced steel tired wood center wheels, etc. Represented by D. A. Stewart, W. N. Sidnam, F. E. McAllister, C. Jackson, Wm. Winterle, L. Bates, H. Whipple, H. R. Miller and W. C. Irwin. Spaces 23-25.

Kellogg Switchboard & Supply Company, Chicago, Ill.—Composite telephone sets for simultaneous telephone and telegraph work; telephone switching equipment and train-dispatching sets equipped with high insulation Kellogg Bakalite receiver shells; moistureproof cords. Represented by W. O. Collins, W. R. Brewer, A. J. Carter, O. F. Cassaday, J. B. Haley, J. H. Hudson, Edward I. Pratt, C. W. Nelson and S. A. Duvall. Space 184.

Kelly-Derby Company, Inc., Chicago, Ill.—Gasoline and oil engines, mechanical rubber goods, steel warehouse and trailer trucks with automatic couplers. Represented by C. W. Kelly, W. B. Holcomb, O. K. Fisher, Vandel Fridlund and Glen Holcomb. Spaces 11 and 30.

Keppler Glass Constructions, Inc., New York, N. Y.—Roof lights and floor lights. Represented by F. L. Keppler and M. H. Foley. Space 213.

The Kerite Insulated Wire & Cable Company, Inc., New York, N. Y.—Kerite insulated wires and cables and Kerite insulating tapes. Represented by Azel Ames, P. W. Miller, J. W. Young, J. A. Renton, J. A. Hamilton, W. H. Fenley and G. A. Graber. Spaces 44 and 63.

Keystone Grinder & Manufacturing Company, Pittsburgh, Pa.—Keystone railroad tool grinder and attachments. Represented by S. S. Newman and J. S. Wincrantz. Space 194.

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—All steel automatic air dump cars. Represented by David Greene and J. S. Mossgrove. Space 189.

Keuffel & Esser Company, New York, N. Y.—Surveying instruments, slide rules, measuring tapes, drawing materials, leveling rods. Represented by E. W. Kraft. Space 47.

Lackawanna Steel Company, Buffalo, N. Y.—Standard and special section, rails, steel sheet piling, rail joints, rail joint plates, hook shoulder tie plates, angle bars. Represented by C. R. Robinson, A. P. Van Schaick, F. E. Abbott, C. H. Hobbs, J. L. Hench, A. H. Weston. Spaces 33-34.

The Lehon Company, Chicago, Ill.—Roofing for cars and buildings; insulating papers for refrigerator cars; waterproofing membranes for bridges, subways, etc.; asphalt shingles; sill covers, canvas roofing for passenger cars and cabooses. Represented by Tom Lehon, D. B. Wright, E. A. Magurn. Space 148.

Louisiana Red Cypress Company, New Orleans, La.—Louisiana red cypress trunking and capping, cross arms, cross ties, crossing signs, snow fencing and other cypress products. Represented by J. W. Parker, H. P. Altman, Wm. F. Robitaille and F. N. Snell. Spaces 201 and 214.

Lufkin Rule Company, Saginaw, Mich.—Measuring tapes and rules. Represented by Theodore Huss, S. B. McGee, Fred Hollingworth. Space 121.

M. W. Supply Company, Philadelphia, Pa.—Vaughan guard rail clamps, Vaughan rail benders and Vaughan track indicators. Represented by David F. Vaughan, David L. Vaughan and Chas. Z. Vaughan. Spaces 119 and 138.

McGraw-Hill Publishing Company, New York, N. Y.—Samples of all the papers published by this company: Engineering News Record; Electric Railway Journal; American Machinist; Power; Coal Age; Electrical World; Contractor; Engineering & Mining Journal. Represented by L. E. Gould, E. J. Hunt, H. L. Brown, H. L. Lomont, E. R. Tratman and L. Gardiner. Space 185½.

MacRae's Blue Book Company, Chicago, Ill.—MacRae's Blue Book. Represented by Albert MacRae, Thomas H. MacRae, Lloyd Simonson, L. R. Rollins and E. B. Cooke. Space 9.

The Madden Company, Chicago, Ill.—Three-men track layer, Richter blue flag derail, Blair tie spacer, Wagner switch point straightener, Muff-Harris ballast screen and Flood anchor clamp. Represented by H. C. Holloway and T. D. Crowley. Space 195.

C. F. Massey Company, Chicago, Ill.—Reinforced concrete trestle, piling, battery wells, manholes, smoke jacks, watchman's houses, culvert pipe. Represented by C. F. Massey, Lee Frank, D. A. Hultgren, H. E. Burns, Chas. Gilman, A. B. Edwards, R. L. Mason, H. W. Wilder, G. B. Massey, E. M. Hathaway, E. A. Gaffigan and E. M. Swenson. Spaces 35 and 54.

Miller Train Control Corporation, Danville, Ill.—A full size replica showing the Miller Train Control devices as attached to the engineer's air brake valve, and also the throttle closing device as used on passenger engines. The exhibit is connected with air pump and automatic signal. Represented by W. B. Murray. Space 197.

Morden Frog & Crossing Works, Chicago, Ill.—Solid manganese frogs; built-up manganese frogs, M. T. S. standard; No. 9 Rex switch stands for facing point switches; Morden facing point switch locks; G. L. M. switch stands; guard rail clamps; rail braces; slide plates; switch adjustments, etc. Represented by Irving T. Hartz, Arthur C. Smith, W. J. Morden, W. Homer Hartz, B. T. Gibbs, H. M. Macke. Spaces 49 and 50.

Mudge & Co., Chicago, Ill.—Mudge motor cars. Represented by Burton W. Mudge, Robert D. Sinclair, William B. Ross, George W. Bender, Charles M. Mudge, Jean K. Vanatta, Clyde P. Benning, Otto P. Becker, Blake C. Howard, Royal D. Hawley, W. D. Jenkins, R. S. Rubincam, Hugh U. Mudge, Clive Hastings, Ellsworth Ingalls, Walter H. Bentley, Fred S. Wilcoxen, H. B. Cogswell, C. C. Smith, Fay Posson. Spaces 127 and 128.

National Carbon Company, Cleveland, Ohio.—Columbia RSA primary track and signal batteries; storage batteries; Columbia dry batteries; hot shot batteries; carbon brushes; lighting, moving picture and photographic carbons; welding and searchlight carbons; Columbia flashlights and flashlight batteries; carbon telephone specialties; special forms in carbon. Represented by Chas. S. Pflasterer, W. H. Arkenburgh, J. M. Spangler, E. L. Marshall, W. R. Pflasterer, R. J. Cox, L. W. Fischer, C. W. Wilkins and Wallace O'Connor. Space 157.

National Concrete Machinery Company, Madison, Wis.—Concrete fence posts, post models and woven wire reinforcements. Represented by J. B. Evans, V. E. Rogers, M. H. Hovey, F. Sanders. Space 165½.

National Indicator Company, Inc., Long Island City, N. Y.—Train indicators. Represented by M. E. Penso and T. M. Wilder. Space 158.

National Lead Company, New York, N. Y.—Dutch Boy red lead. Represented by A. H. Sabin, F. M. Hartley, Jr., and Charles Barr Field. Space 15.

National Malleable Castings Company, Cleveland, Ohio.—Tie plates: creepchecks; rail braces. Represented by James A. Slater, T. W. Aishton, S. H. Brookes and J. J. Byers. Space 105.

The National Lock Washer Company, Newark, N. J.—Hipower nut locks. Represented by R. L. Cairncross, Jesse Hough, John T. Patterson, John B. Seymour, A. T. Thompson. Spaces 192 and 193.

Nichols & Bros., Geo. P., Chicago, Ill.—Inspection car, capacity 8 to 13 persons, speed up to forty miles per hour. Represented by Geo. P. Nichols, S. F. Nichols, R. M. Gaston and R. M. Fries. Space 173.

Northwestern Motor Company, Eau Claire, Wis.—Railway motor cars. Represented by K. K. Rosholt and W. C. Johnson. Space 196.

Ogle Construction Company, Chicago, Ill.—Concrete coaling station, measuring device and automatic worm locking hoisting machine. Represented by R. A. Ogle, C. F. Bledsoe, M. W. Powell, L. S. Murphy. Spaces 12 and 31.

The Okonite Company, New York, N. Y.—Okonite insulated wires and cables; Okonite and Manson tapes. Represented by H. Durant Cheever, Charles E. Brown, Lewis G. Martin, F. J. White, J. D. Underhill, W. R. Van Steenburgh, J. M. Lorenz, R. N. Baker, D. Woodhead. Spaces 16 and 17.

O'Malley-Beare Valve Company, Chicago, Ill.—Multiplate globe angle check valves; Duplex blowout valves; special locomotive valves. Represented by Edward O'Malley, Thos. O'Malley, J. N. Gallagher, E. A. Woodworth, J. M. Pigott, G. A. MacClain, J. E. Brown, H. A. Crews, Thos. L. Queenan. Space 114.

Otley Paint Manufacturing Company, Chicago, Ill.—Eureka Graphoxide ironclad railroad bridge paint; refrigerator, building and signal colors; locomotive joint cements; lubricating graphites and paste fillers. Represented by Benj. F. Otley, Jas. J. Otley and Walter A. Otley. Space 10.

P. & M. Company, Chicago, Ill.—P. & M., Vaughan and Henggi rail anti-creepers; P. & M. bond wire protectors. Represented by F. A. Poor, P. W. Moore, F. A. Preston, L. O. Henggi, Geo. E. Johnson, A. R. Sutter, R. W. J. Harris, F. N. Baylies, J. Reagan, W. C. Lynch, J. E. Mahoney, J. Ritchie, W. W. Glosser, L. C. Miller, S. M. Clancey. Spaces 122 and 123.

Page Woven Wire Fence Company, Monessen, Pa.—Aristos "Copperweld" copper-clad steel wire; bare wire and weatherproof insulation; bond wires and tie wires; Aristos "Copperweld" copper-clad steel nails; "Armco" (American ingot) iron wire. Represented by J. A. Roesch, Jr., F. W. Walters, W. C. French, Byron Elliot, Frank Elliot, W. S. Krenz, C. B. Semple, W. T. Kyle, F. P. Clement. Spaces 181 and 182.

W. W. Paterson Company, Pittsburgh, Pa.—The largest sizes of steel and wood tackle blocks. Represented by W. W. Paterson. Space 145.

Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.—Steel water tanks. Represented by Max Whitacre, C. L. Todd, W. W. Hendrix, J. E. O'Leary and A. C. Pearsall. Space 103.

Pocket List of Railroad Officials, New York, N. Y.—Represented by J. Alexander Brown, Harold A. Brown and Charles L. Dinsmore. Space 26.

Positive Rail Anchor Company, Marion, Ind.—Rail anchors, guard rail braces, tie plates. Represented by F. M. Robbins, J. A. Shoulty, A. H. Told, L. C. Ferguson, E. A. LeBeau, W. Harding Davis. Spaces 178 and 179.

Protective Signal Manufacturing Company, Denver, Colo.—Worm drive wig-wags, a. c. and d. c.; model E a. c. and d. c. bells; a. c. and d. c. relays; model C oscillators; a. c. and d. c. time units; crossing signal masts. Represented by A. M. Adams and W. C. Neahr. Space 168.

Pyrene Manufacturing Company, New York, N. Y.—Pyrene fire extinguishers and fire appliances of various kinds. Represented by W. H. Yetman, E. W. Day, Geo. Doscher, H. V. Boykin, W. B. Paulson. H. V. Flora, R. G. Henderson, Wm. D. Dorry, Geo. C. Breidert. Space 186.

The Q. & C. Company, Chicago, Ill.—Wig-wags, derails, Bonzano joints, step joints, rail braces and guard rail clamps. Represented by C. F. Quincy, F. F. Kister, E. M. Smith, J. V. Wescott, E. R. Packer, E. Quincy, R. B. Quincy, L. T. Burwell, A. Robertson, C. M. Brennan, W. W. Hoit and M. S. Morse. Spaces 120 and 139.

Railroad Supply Company, Chicago, Ill.—Tie plates, derailers, wig-wag signals, electric crossing gates and other devices and material for the protection of highway crossings. Represented by E. H. Bell, H. M. Buck, M. J. Fox, P. W. Kohnen, Geo. W. Nibbe, R. S. Prentice, A. H. Smith, H. G. Van Nostrand and F. C. Webb. Spaces 85 and 104

Rail Joint Company, New York, N. Y.—Continuous Weber, Wolhaupter and 100 per cent rail joints; continuous Weber and Troy insulated joints; continuous frog and switch joints, continuous compromise joints. Represented by G. C. Isbester, V. C. Armstrong, L. G. Ball, James C. Barr, Wm. S. Boyce, W. J. Bradley, Alex. Chapman, W. A. Chapman, E. A. Condit, Jr., Jas. A. Greer, C. B. Griffin, C. C. Henkel, H. C. Hickey, Percy Holbrook, Chas. Jenkinson, G. H. Larson, C. R. Maycock, J. N. Meade, J. G. Miller, J. P. Norton, R. W. Payne, E. F. Schermerhorn, R. R. Seward, R. W. Smith, F. C. Stowell, McLeod Thomson, W. Paton Thomson, E. L. Van Dresar, F. C. Webb, Edw. Y. Weber, G. T. Millard, Benj. Wolhaupter, C. A. Disbrow. Spaces 81-82.

Railway Age Gazette.—See Simmons-Boardman Publishing Company. Space 45.

Railway Electrical Engineer.—See Simmons-Boardman Publishing Company. Space 45.

Railway Maintenance Engineer.—See Simmons-Boardman Publishing Company. Space 45.

Railway Mechanical Engineer.—See Simmons-Boardman Publishing Company. Space 4.

Railway Motor Car Company of America, Chicago, Ill.—Kerosene-operated track service car for getting men to destination and for doing track repair work by power instead of by hand labor. Represented by F. A. Lester, R. G. Lester, H. C. Beitler, W. O. Worth and A. A. Thompson. Spaces 220-221.

Railway Review, Chicago, Ill.—Publications. Represented by H. A. Smith, W. A. Smith, W. M. Camp, C. L. Bates, J. E. Gougeon, R. R. Grieg, Arthur Hooven. Space 64.

Railway Signal Engineer.—See Simmons-Boardman Publishing Company. Space 45.

Ramapo Iron Works, Hillburn, N. Y.—One No. 8 manganese frog made of 105-pound rail; automatic switchstands; guard rail clamps; switch clips; solid rolled double-shoulder slide plates. Represented by Jas. B. Strong, Thos. E. Akers, Arthur Gemunder. W. C. Kidd. Spaces 109-110.

Reading Specialties Company, Reading, Pa.—Guard rail clamps; compromise joints; car replacers; rail benders; tie spacers; Tiger bunks. Represented by M. G. Moore, B. J. Buell, Daniel H. Fowler, L. H. Atkinson, S. M. Hindman, Henry G. Finnell, Leonard Schuetz. Spaces 190-191.

Roberts & Schaefer Company, Chicago, Ill.—Photographs of fireproof locomotive coaling plants and "Rands" gravity sand plants. Represented by Clyde P. Ross, E. E. Barrett, John J. Roberts and C. C. Brackett. Space 48.

Safe Lock Switch Machine Company, Lexington, Ky.—Safe lock switch machine (full size) and miniature crossover equipped with miniature safe lock switch machine. Represented by C. Dougherty, D. M. Case and C. F. Jones. Space 168½.

Searchlight Company, Chicago, Ill.—Represented by D. S. Harding, J. H. Barry, G. M. Wyman, B. M. Law, S. H. Shaykin, E. A. Becker, R. A. Sossong. Space 228.

Sellers Manufacturing Company, Chicago, Ill.—Wrought iron tie plates. Represented by John M. Sellers, R. A. Van Houten, Geo. M. Hogan. Space 124.

Signal Accessories Company, New York, N. Y.—Railway signal materials. Represented by F. C. Lavarack, C. R. Ahrens, A. A. Ziegler and L. N. Downs. Space 118.

Simmen Automatic Railway Signal Company, Buffalo, N. Y.—Continuous cab signal and Simmen dispatcher's table showing central control of signals and automatic recording of train movements. Represented by P. J. Simmen, W. H. Crawford, C. E. Chatfield and L. Ringer. Spaces 5-6.

Simmons-Boardman Publishing Company, New York and Chicago.—Railway Age Gazette, Railway Maintenance Engineer, Railway Signal Engineer, Railway Mechanical Engineer, Railway Electrical Engineer. Represented by L. B. Sherman, Samuel O. Dunn, Henry Lee, C. R. Mills, Frank S. Dinsmore, F. H. Thompson, H. H. Marsh, J. H. Bryan, Roy V. Wright, E. T. Howson, H. H. Simmons, W. S. Lacher, G. I. Lacher, A. F. Stuebing, J. M. Rutherford, R. H. Smith, G. A. Cooper, J. H. Cross, M. S. Foote, T. E. Crossman, W. J. Voss. Space 45.

T. W. Snow Construction Company, Chicago, Ill.—Water and oil cranes, coal chute model, hoop exhibit on tank section. Represented by T. W. Snow, W. A. Lathrope and Barton Snow. Space 46.

Southern Pine Association, New Orleans, La.—Southern yellow pine lumber and timber used in railroad construction. Represented by Dr. Hermann von Schrenk, L. R. Putnam, F. V. Dunham and R. H. Gheen. Spaces 204-211.

Squire-Cogswell Company, Chicago, Ill.—Hydrants and hydrant valves for stockyards, cinder pits, coach yards, etc.; freight house fire hydrants; thawing outfits for switches, interlockings and yards. Represented by Charles P. Cogswell, Willis C. Squire and William Volkhardt. Space 160½.

Standard Asphalt & Rubber Company, Chicago, Ill.—Sarco mineral rubber floors, Sarco No. 6 waterproofing, asphalt roofing cements, asphalt fillers, refrigerator compounds, pipe coatings, paints, putties, insulating compounds. Represented by Charles V. Eades, R. F. Trumbull, E. K. Carter, G. F. Thornton and W. A. Dicus. Spaces 161-162.

Templeton, Kenly & Co., Ltd., Chicago, Ill.—Simplex track and car jacks, Simplex automobile and wrecking jacks and Simplex pole pulling jacks. Represented by W. B. Templeton, A. C. Mills and H. W. Finnell. Space 32.

Toledo Scale Company, Toledo, Ohio.—Portable automatic scale; self-contained dormat scale, 1,000-lb. dial capacity; 6 ft. by 8 ft. suspension platform dial scale, 12,000-lb. capacity. Represented by H. O. Hem, Harvey Anderson, C. F. Moore, W. H. Roberts, Harry F. Anderson, C. H. Hapgood, H. D. Ridge.

Track Specialties Company, Inc., New York, N. Y.—Superior compromise rail joint, Trasco guard rail clamp, Trasco guard rail brace, Superior hand throw derailer, Superior mechanically operated derailer, Superior rail bender, Trasco rail brace, Trasco tie plate, Trasco padded tie plate, Superior rail joint. Represented by W. B. Lee. Space 207.

Tyler Underground Heating System, Pittsburgh, Pa.—Apparatus for the protection of steam lines under ground and in tun-

nels; steam traps; steam condensation meters; hot water meters; expansion joints. Represented by E. B. Tyler, Fred G. Otto, Lee Philips, Louis Underhill, Fred M. Smith. Space 172.

Union Switch & Signal Company, Swissvale, Pa.—Two unit push button machine; Style T-2, 3-position a. c. signal; three-position top post electro-pneumatic signal; Style B 60-deg. upper left hand quadrant; Style S 3-position, 10-volt d. c. signal; Style L color light signal; position light signal; dwarf position light signal; electro-pneumatic switch and lock movement; Type G (Garber) switch and lock movement; a. c. relays; d. c. relays; transformers; reactors; time release; Model 14, Keystone insulated rail joints; forgings; Type M electric switch movement. Represented by G. A. Blackmore, W. P. Allen, Aaron Dean, H. W. Griffin, J. J. Cozzens, H. A. Hamilton, T. H. Patenall, J. L. Brastow, A. L. Humphrey, T. W. Siemon, L. F. Howard, J. E. Saunders, J. P. Coleman, W. H. Cadwallader, H. A. Wallace, W. P. Neubert, C. O. Harrington, W. Zable, E. R. Coe, John Stull, C. O. Boyle, J. S. Hobson, V. K. Spicer, W. W. Talbert, J. F. Talbert, S. E. Gillespie, J. L. Loucks, George Marloff and H. R. Sheene. Spaces 41, 42, 60, 61, 62.

U. S. Wind Engine & Pump Company, Batavia, Ill.—Cypress, redwood, fir and white pine water tanks; round, half-round and flat hoops for tanks; steel towers for supporting tanks; tank fixtures; water columns, both rigid and telescopic spouts; switch stands and semaphores; Curtis pumps and appurtenances; windmills. Represented by L. E. Wolcott, C. E. Ward, J. P. Prindle, G. E. Vermilyer and F. E. Pearson. Spaces 111-112.

Verona Tool Works, Pittsburgh, Pa.—Track tools, track jacks, gages, benders, levels and nut locks. Represented by H. S. Paul, H. Fischer, E. Woodings and H. C. Mull. Space 129.

Volkhardt Company, Inc., Stapleton, N. Y.—Hydrants for general use in shop and coach yards. Represented by Wm. Volkhardt. Space 161½.

Waterbury Battery Company, Waterbury, Conn.—Waterbury unit cylinder primary batteries and renewals, Waterbury separate cylinder primary batteries and renewals, Waterbury plate type primary batteries and renewals, Gordon primary batteries and renewals, Waterbury track batteries and renewals. Represented by C. B. Schoenmehl, E. E. Hudson, G. A. Nelson, E. A. Everett and S. J. Hough. Space 18.

Wayne Oil Tank & Pump Company, Fort Wayne, Ind.—Oil storage and distributing systems; gasoline storage system for signal stations; special signal oil storage and transfer system. Represented by B. F. Geyer, F. A. Berghoff. Space 171.

Western Electric Company, N. Y.—With the exhibit of the General Electric Co. Represented by Geo. H. Porter, L. A. Muttart, J. C. Binning, T. J. Rider, H. C. Olmstead. Spaces 200-215.

Wm. Wharton, Jr., & Co., Inc., Easton, Pa.—Solid Tisco and Tisco manganese steel insert frogs, including M. T. S. standards; manganese tipped split switches; Wharton-O'Brien insulated switch rods; W. J. switch stands; guard rail clamps and anti-spreading tie plates. Represented by V. Angerer, R. D. Chapman, C. M. Griffith, C. B. Andrews, H. F. McDermott, G. R. Lyman, S. G. Llewellyn, M. Imbrie, J. A. MacFadgen and D. L. Swank. Spaces 68 and 69.

Wyoming Shovel Works, Wyoming, Pa.—Red edge chrome nickel track shovels. Represented by H. T. Potter, G. E. Greer, J. C. Dolan and J. F. Leonard. Space 225.

Yale & Towne Manufacturing Company, New York, N. Y.—Yale triplex chain blocks; switch locks; night latches; door closers; moving model of the interior of a Yale lock. Represented by W. J. Nahrwold, W. C. Bigelow, R. J. Kleinschmidt, H. C. Carlson, W. A. Lockwood, L. W. Kregner. Space 13.

HEALTH BULLETIN

President Dunham of the Railway Signal Association was kept busy yesterday morning explaining the sling which supported his good right arm. "A fall" was his regular response to inquiries, usually followed by an assurance that he has not abandoned his temperate habits. The fall occurred on last Thursday evening on an icy sidewalk, and resulted in a rather serious sprain in the shoulder.

CONVENTION PROGRAM

The eighteenth annual convention of the American Railway Engineering Association will be called to order by President A. S. Baldwin at 9:30 this morning. There will be three sessions today, the morning session adjourning at 12:30 p. m., the afternoon session lasting from 2 to 5 p. m., and the evening session opening at 7:30 p. m. Following is the program for the entire convention:

Tuesday, March 20

President's Address.
Reports of Secretary and Treasurer.
Reports of Standing and Special Committees.

X.	Signals and Interlocking	Bulletin 192
XVIII.	Electricity	Bulletin 191
IX.	Signs, Fences and Crossings	Bulletin 192
XIII.	Water Service	Bulletin 193
VII.	Wooden Bridges and Trestles	Bulletin 193
Special.	Stresses in Railroad Track	Bulletin 193
XIX.	Conservation of Natural Resources	Bulletin 193

Wednesday, March 21

V.	Track	Bulletin 193
II.	Ballast	Bulletin 193
III.	Ties	Bulletin 193
I.	Roadway	Bulletin 194
XX.	Uniform General Contract Forms	Bulletin 194
XVI.	Economics of Railway Location	Bulletin 194
XIV.	Yards and Terminals	Bulletin 194
XI.	Records and Accounts	Bulletin 194
VI.	Buildings	Bulletin 194

Annual Dinner at 6:30 p. m.

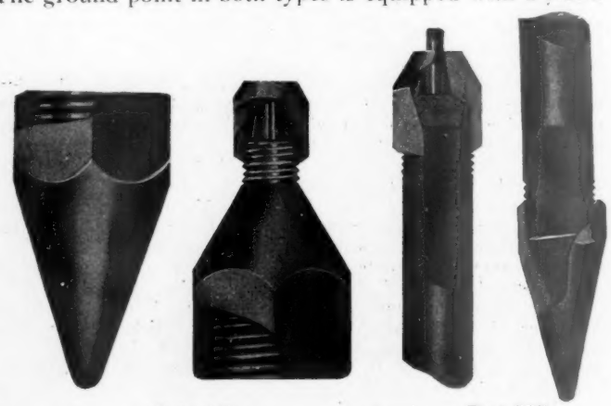
Thursday, March 22

Special.	Grading of Lumber	Bulletin 194
VIII.	Masonry	Bulletin 194
XV.	Iron and Steel Structures	Bulletin 195
XII.	Rules and Organization	Bulletin 195
XVII.	Wood Preservation	Bulletin 195
IV.	Rail	Bulletins 188, 195

New Business.
Election and Installation of Officers.
Adjournment.

FARGO GROUNDING DEVICES

The Fargo Manufacturing Company, Poughkeepsie, N. Y., has placed on the market two types of solderless cold weld grounding devices which can be applied to any length of pipe, ranging in size from ¾ in. to 1¼ in. The ground point in both types is equipped with a standard pipe thread and is screwed to the lower end of the desired length of pipe. In type A, the cap has a solderless connection which can be easily removed for testing the ground and can be replaced when the tests are completed. In type B, the cap is equipped with a cone and bushing to be placed on the top end of the pipe, the



Type "A" *Type "B"*

Fargo Solderless Connector Grounding Devices

wire leading to the ground being placed in the cone and the cap screwed to the pipe. A cold weld connection is thus made which can easily be removed for testing purposes.

The pipe can be installed by the use of a drive head, also furnished by this company, consisting of a hexagonal piece of cold rolled steel with a standard pipe thread so that it can be screwed on the top end of the pipe to be driven. Striking this head with hammers does not injure the threads, as the same method is used in driving artesian wells, where many tons of pressure are brought to bear on the driving head. This type of ground can be applied quickly and economically, and the resistance of the ground can easily be tested by unscrewing the ground cap.

THE NEW WATERBURY R. S. A. PRIMARY BATTERY

The record of development, during the past decade, of caustic soda primary battery cells used in signaling is one of rapid and continuous progress. It is, indeed, questionable if any other device used in this field has been the subject of such effort as has been displayed in the making of the primary battery more efficient and dependable for the purposes to which it has been applied, as well as in broadening its scope of usefulness by proving its suitability for many classes of service for which other forms of energy have been employed in the past.

Not more than ten years ago considerable uncertainty existed concerning the continued use of primary cells in signaling, and at that time other sources of power were employed in a number of low-voltage d. c. signal installations. This was attributable only in part to lack of faith in the reliability of the product of that time. What was even a greater consideration was the increase in current required because of the use of signals designed to clear in less time than required by older styles, the increase in counter weights, and the more general use of relay contacts in both sides of the circuit, and it was due to uncertainty as to the capacity of the primary battery properly to take care of the heavier load and more rigid requirements that some engineers were led to seek other sources of power for signal operation. But the possibilities of the primary battery were not generally appreciated at that time, and it is chiefly because the development of the cell has more than kept pace with the increasing demands upon it that it is now such an important factor in signaling.

Today, the value of the primary battery in signaling has been so firmly established that it is constantly being applied to new uses, and it is no longer regarded by engineers as an element of uncertainty in a signal system. On the contrary, this type of battery has acquired such a reputation for reliability and efficiency that it is now being freely applied to well engineered, modern installations involving the use of the primary cells not only for the operation of automatic signals, track circuits, and the charging of storage batteries, but also for the much heavier work of operating switch movements, position light signals and semaphore signal lights, or for other vital or heavy duty functions which are a part of the modern scheme of railway signaling.

That a truly remarkable degree of dependability has been attained through the progressive development of primary cells will be apparent on consideration of the extraordinary freedom from failures attributable to the batteries, notwithstanding the great number of cells that are now in constant use for various classes of work and under all conditions of service. An analysis of the performance of standard primary cells will show that, in addition to this absence of failures, there has been evolved such a dependence in the life of the cells that in many cases definite renewal periods have been established, varying only with the amount of work done, and it has become possible to carry out this plan without the sacrifice of any considerable amount of unconsumed active material. In other, and perhaps the majority, of cases, determination of the approaching necessity for renewal is governed by the appearance of the elements, which are so proportioned as to produce a visible indication of the condition of the cell well ahead of the time when it must be renewed.

In all cases where operating conditions remain practically the same and the load on the battery, or ampere-hour consumption, is not increased, a very close approximation of the life of each battery may be made, and when this, together with the visible indication of the condition of the cells, is used as the basis of renewal, the full capacity of active materials may be obtained, thus insuring the greatest economy in the operation of the cells.

The stability of prices as well as the great reliability of product is a most important consideration favoring the use of batteries of this type. This feature of the primary battery has been very well demonstrated throughout the period of high prices existing during the past two years, for, while the prices of all metals and chemicals increased enormously, there has been only a comparatively slight increase in the prices of caustic soda primary batteries and renewals. During this period, for example, prices of zinc, copper sulphate, mercury and other materials increased more than 300 per cent, while at the same time prices for active materials of caustic soda primary cells increased only about 40 per cent.

Although the application of caustic soda cells to track circuit work during the past two years undoubtedly has been greatly stimulated by this very slight increase in price as compared with the great increases in cost of other available sources of energy, the more or less general adoption of the caustic soda cell for track circuit operation was well under way before the beginning of the period of abnormal prices, brought about by the development of this type of cell to such an extent that it proved to be a matter of economy, as well as an improvement of service to apply it to track circuits, even at the normal prices prevailing before the war.

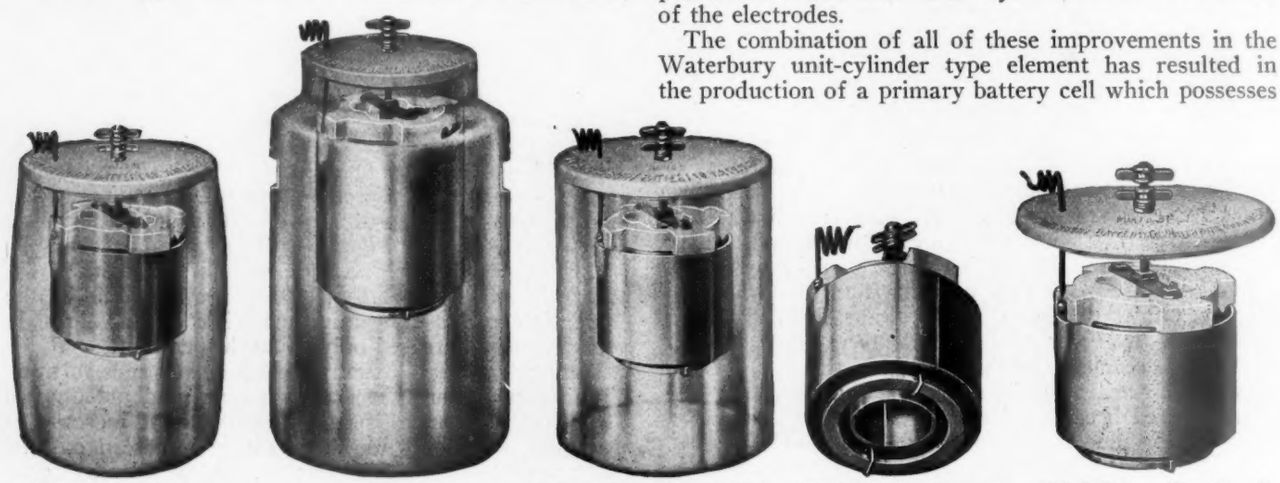
With the perfection and introduction of the new Waterbury unit cylinder type primary cell, the efficiency of this class of battery has been increased more than 100 per cent during the past ten years. In other words, the life of a battery composed of these new cells will be at least twice as great as the life of a signal battery of ten years ago, if used for the same service, and much better operation will be obtained, notwithstanding that the duty has become much heavier and the requirements far more exacting. This has been accomplished without increasing the size of the jar, and, assuming equal prices for raw materials, at practically no increase in cost, even if no consideration is given to the comparatively large proportion of failures that occurred at that time and the practical absence of them now.

The Waterbury unit-cylinder element possesses a number of new and important distinctive features. As its name implies, it is constructed as a unit. The cylinder type of electrode, which has been a specialty of the Waterbury Battery Company, has been taken as a base. The copper oxide electrode, which is much larger in diameter and shorter than copper oxide cylinders manufactured heretofore by this concern, is located between two circular zincs, and all are secured to and suspended from a circular porcelain insulator.

A threaded steel rod, attached to a metal bridge piece, which is also secured to the bolts that support the copper oxide cylinder, serves to suspend the element from the cover and also as a binding post or terminal for the positive pole of the cell. A rubber-covered copper lead wire is attached to one of the bolts by which the two zincs are fastened to the porcelain insulator.

As will be seen from the accompanying illustrations, the entire element makes a most compact unit, having a minimum number of parts. The zincs and copper oxide cylinders are drawn up firmly against the under side of the porcelain insulator, having V-shaped fins projecting downward between the cylinders. The copper oxide cylinders are supported by two long hook-bolts, the hooks of which embrace the lower edges of the cylinder. The zincs are supported by amalgamated copper strips projecting from their upper edges and secured by bolts passing through horizontal holes in the porcelain insulator.

The new type elements are manufactured in four sizes, having rated capacities of 400, 500, 600 and 1,000 ampere hours. The 400 and 500 ampere hour sizes are designed for use in standard R. S. A. signal cells. The new 600 and 1,000 ampere hour cells are furnished with special jars having larger solution capacity. These high capacity cells are especially adapted, because of their very high normal discharge rates, for service requiring a heavy current flow, such as the operation of low-voltage switch machines or position-light signals, or for other work where the current consumption is such as to necessitate too frequent renewal of cells of lower capacity.



R.S.A. 400 or R.S.A. 500 with Barrel-Shape Jar. *C-1000.* *C-500 or C-600 with Cylindrical Jar.* *Unit-Cylinder Element, Bottom View.* *Unit-Cylinder Element Attached to Cover.*

Waterbury Unit-Cylinder Elements—Capacity, 400, 500, 600 and 1,000 Ampere Hours

The rated capacities of Waterbury unit-cylinder type elements are based upon the output obtained at a continuous discharge of three amperes before the potential drops below .5 volt per cell. Therefore, they are not comparative with the rated capacities of previous types, based upon the output obtained at a continuous discharge of one ampere.

The design of the parts and the manner of assembly insure uniform spacing and rigid assembly of the zincs and copper oxide cylinders, resulting in a high degree of uniformity in service; all elements being substantially alike.

The zinc and copper oxide cylinders have been made as large in diameter as practicable for use in standard jars, so as to have the greatest possible area of active material suspended in the upper portion of the electrolyte, thereby giving the cell an exceptionally low internal resistance.

The cylindrical shape of the electrodes has made it possible to suspend this large area of exposed active material within a few inches from the top of the jar. This has a number of advantages: It reduces the decrease in voltage during the useful life of the cell by effecting a more even reduction of the electrodes. It accelerates the diffusion and settling to the lower part of jar of the products of decomposition, thus giving the cell even a higher normal discharge rate than would ordinarily result from such a large area of active material. It decreases the effect of the cold during the latter part of the life of the cell because there is little or no increase in density in that portion of the electrolyte in which the element is suspended, thus giving the practical equivalent of a fresh electrolyte throughout the life of the cell. It eliminates practically entirely crystallization of the solution affecting the action of the cell, since the saturated portion of the solution is always well below the bottom of the electrodes.

The combination of all of these improvements in the Waterbury unit-cylinder type element has resulted in the production of a primary battery cell which possesses that most desirable characteristic which has been so long sought in commercial primary cells, viz., greater constancy of voltage throughout the life of the cell and the consequent substantial reduction in the waste of energy from excessive current flow when the battery voltage is considerably above the lowest point attained in service. This has always been regarded as far more important than the production of a cell having a higher voltage, but lacking constancy.

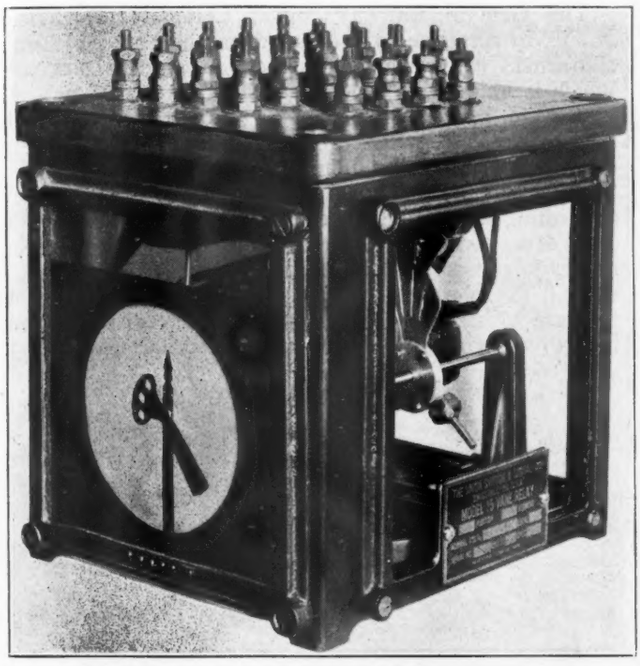
NEW UNION SWITCH MOVEMENT AND OTHER DEVELOPMENTS

The style M switch and lock movement recently placed on the market by the Union Switch & Signal Company, Swissvale, Pa., is designed to meet the most severe servive encountered in electrically-operated railroad switches. By the substitution of a worm gear for part of the gear train, the size and weight of the movement have been reduced to the minimum consistent with ruggedness and accessibility. Its compactness makes it especially fitted for use where space is limited and its lightness allows it to be easily handled and installed. The worm gearing locks the switch against movement due to external forces.

The efficiency of the mechanical transmission is maintained by having the worm wheel actuate motion plates, one driving the slide bar which drives the detector bar and the other the operating rod. The usual cycle of

operation, namely, unlocking, throwing the points and locking, is followed by these motion plates. The load on the motor is thereby distributed over the full stroke so as to obtain the most economical operation.

Between the motor and the worm gear there is interposed a simple disc friction clutch, which provides ample protection for the gear train against shock which might result from throwing the switch against obstructions of any kind and which serves to absorb the shock on completion of the movement. This clutch maintains a constant coefficient of friction under wide variations in load and is not affected by oil or moisture. The friction discs are made from a well-tried automobile brake lining material, have a long life, and are quickly and easily replaced.



New Tower Indicator

The operation of the movement is such that the switch is locked in its normal or reverse position by means of the operating rod as well as by the lock rod. All moving parts subject to severe stress are drop forged and heat treated. Means are provided for manual operation in case of absence of power. Lubrication of the operating parts is provided for in such a way that frequent applications of lubricant are unnecessary.

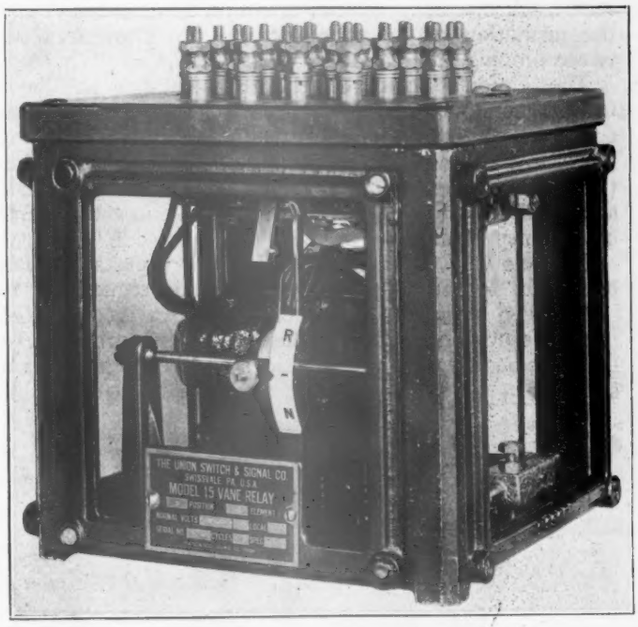
A circuit controller operated by the slide bar is provided for the motor cutout and standard indication circuits. The contacts of this controller are adjusted in such a way that the indication circuit is always disconnected from source of energy and short circuited, except when the switch points are in either of their extreme locked positions. A separate point detector attachment may be incorporated in the circuit controller if additional protection afforded by a separate connection to the switch point is desired. The circuit controller is easily inspected and adjusted. All outside wires are brought to a common terminal board at the motor end; all internal wiring is installed at the factory.

The movement is suitable for either right or left hand application without special parts. It can be applied to single switches or movable point frogs with or without detector bars. It can be furnished for operation on high or low voltage direct current, or alternating current of any standard voltage, and at 25 or 60 cycles. The slide bar is arranged for detector bar operation from either end of the movement.

A switch indicating relay has also been developed, using the standard model 15 vane construction. A pointer, mounted on the shaft, moves over a white enameled scale which is marked to designate the "Normal," "Reverse" and "De-energized" positions of the relay. These positions correspond to the "Normal," "Reverse," and "Intermediate" positions of the switch points.

This relay is two-element, three-position, and can be wound for line or track circuit control. The "controlled" element has its circuit carried through a pole changer or a suitable electric selector which is operated by the switch points. The "local" element of the relay is supplied with power from a local source in the tower.

Due to the lower power consumption of the controlled element, this relay can be used as a track relay to indicate the position of switches in classification yards where there are long lead runs between the tower and the track circuit. It is understood, of course, that when thus used the de-energized position ordinarily indicates either that the switch is in the intermediate position or that the track circuit is occupied by a train. Should, however, the relay assume the de-energized position due to defective circuits, the pointer will quickly indicate to the maintainer the relay which needs attention. This relay meets R. S. A. specifications in all respects and can be wound for any standard voltage and frequency.



Switch Indicating Relay

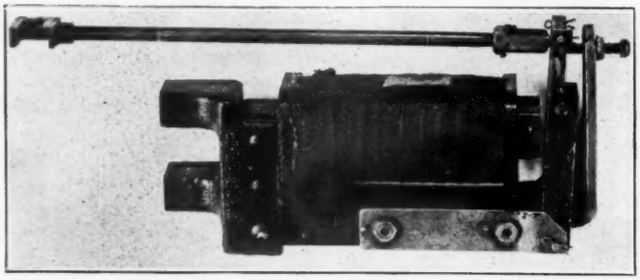
For use on interlocking machines, this company has developed an alternating current indication magnet of the electro-magnet type, which is characterized by simplicity, reliability and low power consumption. It employs a spool-wound coil, which, if damaged, can be quickly replaced. It meets R. S. A. insulation requirements, and can be wound for any standard voltage and frequency.

By the use of a laminated magnetic circuit, iron losses are reduced to a minimum. When energized on normal frequency, the magnet is quiet at any potential above 75 per cent of normal. The construction is rigid. Ample clearances are provided between stationary and moving parts. A shield prevents accidental operation of the magnet. The stroke of the operating stem is adjustable.

A suitable backstop is provided to keep the latch from dragging on the lever segment. Stop pins of suitable non-magnetic material are provided for maintaining the proper air gap between the armature and the stationary core.

It can be fitted to the older types of interlocking machines, which are now equipped with the ironclad indication magnet.

The model 15 vane type relay, manufactured by this company, is now equipped with a porcelain top plate and



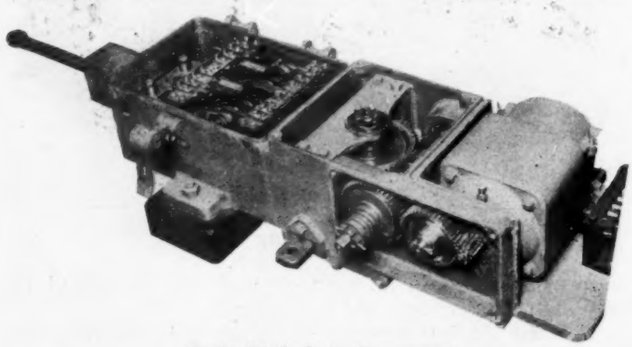
A. C. Indication Magnet

vertically non-adjustable, non-turning contact posts. This relay is universal in its application. It can be used as a two or three-position track, line or indication relay. It can be used on steam or electric road alternating current track circuits. Special attention has been given to the insulation of its windings and the clearances between moving and stationary parts.

The Union's standard relay construction has been used throughout. Special features of this relay are non-corrosive bearing materials, minimum friction of moving parts, low contact resistance, wide vertical air gaps between pole faces, quick and positive action of contacts, and the ease with which all operating and contacting parts can be inspected.

It meets R. S. A. specifications in all respects and can be wound for any standard voltage and frequency.

A tower indicator attachment has been incorporated in a two-position relay of this type, thus providing a tower indicator with the functions and refinements of a standard relay. It can be furnished as a single or double



Style M Switch Movement

element, line or track relay. The indicator can be of either semaphore or disc type.

The small amount of power required by the track winding of the two-element relay makes this tower indicator relay suitable for direct control from long track circuits having adverse ballast conditions and long lead runs to the tower. By using individual feeds for the track circuit, broken down insulated joint protection is obtained.

Due to its contact capacity (maximum of 12 independent contacts) the use of repeater relays can be generally dispensed with; due to its quick shunting, it is particularly adapted for use on detector track circuits. Thus in a single instrument are combined the functions of repeater relay, a detector relay and a tower indicator.

The construction of the tower indicator equipment is such that the Model 15 relay's visibility and reliability of operation are not impaired. The location of the indicator mechanism inside of the relay provides for sealing in accordance with standard relay practice.

G. R. S. ELECTRIC BOLT LOCK

The General Railway Signal Company, Rochester, N. Y., in response to a demand on the part of certain signalmen, has recently designed an electric bolt lock which is unique. The lock is housed in a flat cast-iron case 20 in. long by 10 in. wide. It is actuated by a solenoid-type electro-magnet comprising a pair of pick-up coils and a pair of holding-coils using a U-shaped core. The yoke of the core is connected by means of two short connecting links and a lever arm to an oscillating shaft. This lever arm also operates the lock plunger which moves in unison with the four circuit controllers on the shaft. The plunger is guided by a hole in the bottom of the case which, when the magnet is de-energized, permits it to drop through a hole in the lock rod attached to the



The G. R. S. Electric Bolt Lock

switch points. When the lock is energized the plunger is withdrawn from the lock rod and occupies a position as shown in the illustration.

The design of the bolt lock is as simple as a solenoid dwarf signal and its parts are exceptionally rugged throughout. It operates on 110-volt direct current. A trunking cap is provided which can be placed on either side of the case as desired. Two contacts are available for the control of external circuits, the other two contacts control the pick-up and the holding coils for the electro-magnet in the usual manner. The lock meets the R. S. A. insulation test of 3,000 volts a. c.

The electric bolt lock will appeal to those who desire to provide an additional check on their electrically operated switch machines in connection with all-electric interlocking as it provides a separate facing point lock feature which carries out the same idea as has been long in use in connection with mechanical interlocking. Others will have outlying switches located in the vicinity of an all-electric interlocking plant which they desire to lock up from the interlocking machine. The lock is also adaptable as a means for locking a drawbridge.